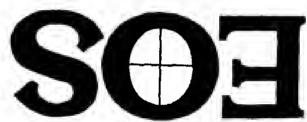


Vol. 64 No. 5 February 1, 1983 Transactions, American Geophysical Union



EOS, Transactions, American Geophysical Union

Vol. 64, No. 5, Pages 41 - 48

February L.B

Chemical Oceanographer. Assistant Professor, tenure track position for applicants with Levent Ph.D. and contracted and interest in contempo Ph.D. and competence and interest in contemporary marine chemistry or geochemistry. Detties will lacticude det elupinem of research projects and some teaching. Salary negotiable depending upon experience and qualifications. Submit resume and names and addresses of thee reference by I March 1983 to: G. Ross Heath, Dean, School of Dreamographs. Oregon State University, Carvallis, Oregon 97331.

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Research Physicias in Ionospheric/Magnetospherle Physics. Two professional lerel research positions are available in the Physics Department a Boston College. Both require Ph.Ds. A research physicist will have responsibility for analysis of autroral
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high energy particle data analysis program for forth
coming satellites. Extensive knowledge of the radiation belts is required, as is experience in large volune data handling and numerical modeling of high
energy particles. Salary is negotiable. Pleuse send restances to: Prof. R. A. Uritam, Chalmian, Department of Physics/MACR, Roxton College, Cleening
Hill, MA 02187. Boston College is an affirmative action/equal op-portunity employer.

Faculty Position/Princeton University Department of Geological and Geophysical Sciences. We are looking for an exceptionally creative individual in the general area of paleontology—straigraphy—sedimentology for terrure-track appointment as Assistant Professor. Rapid increases in understanding of the processes and history of the earth's surficial environment have come about through analytical and theoretical advances in many specialities, such as magnetic stratigraphy, tay subneralogy and geochemistry, seismic atruitgraphy, isotopic and microanalytical studies of fossils and sediments, sedimentation related to crustal tettonics, and studientalical analysis of stratigraphic and paleontological data. We seek analdottes with strong interdisciplinary research interests in areas such as those litted, with the analytical skills and foresight to work effectively on the frontier. Within the department, the appointed as stratigraphy, paleontology, or sedimentology, or sedimentology, our provide a broad historical perspective. We plan to back up this appointingm by our program appropriate.

for a general expansion of laboratory facilities, as appropriate. Inquiries should be usade to: if A. Phinney, chairman, at the above addrests, or by phone, (809) 452-4100. While later applications will be considered, we would like to lurge them by the \$12.00 June 1999, 1983, or cartier, if considered, applicants about the stability, 1983, or cartier, if considered, applicants about the stability of resistivity plans and optimized. Princeton United stability is an equal proportionally sine; application employer.

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Graduate Research and Teaching Assistantiahlps in Marine Geochemistry. The Hawaii Institute of Geophysics invites applications from students interested in M.S. and Ph.D. programs in marine chemitty and geochemistry. Areas of research include marine organic and inorganic geochemistry, isotope geochemistry, and geochemistry, geochemistry, isotope geochemistry, and increations, sediment diagenesis, geochemical cycling, and tropical seawater chemistry. Current slipends are 3:447-576 per month for 10 or 12 month appointments. For further information, write:

Dr. K. E. Chave, Head
Marine Geochemistry Division
Hawaii Institute of Geophysics
1000 Pope Rd.
Honolulu, H1 93822.

Graduate Reaearch Assistantships Avallable/Department of Meteorology, South Dakots School of Mines and Technology. Several graduate research assistantships are available beginning Full 1983 in the areas of numerical cloud modeling, cloud physics, weather modification, radiative transfer studar increorology, mesometeorology, and oir polition chemitry and physics. Grachisto study (students) as a Master of Science degree in Meteorology at Sophistics of Science degree in Meteorology at Sophistics of Science degree in Meteorology at Sophistics of the students of the studen

Course) Dr. Briant L. Lavis, Acting Heal, Department of Meteorology, Smith Jakots School of Allices and Texbrodogy, Rapid Chy. South Baket 57701-2005 Religitions 805234-22018

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Indicagnations majors in engineering, physics and geophysics are encouraged to apply, for significant engineering.

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ume research assistantiships with starting relative ronging from \$8,000 m \$12,500/12 months. The pending on the degree being sought and the dean's qualifications. All ruition and fees are desired by the institute. Interested students should write to:

Dr. Douglas Davis
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Allanta, GA \$0332.

INSTITUTE ON FLOOD

June 27-July 1, 1983 Colorado Stote University Fort Collins, CO

Special written lecture notes for predict mation and forecasting of floods. Wall know ods based on stolistics, mathematical modern methods will be described. R. Clark

H. Shen V. Yavjevich Fas: \$500.00 Limited funds available from UNE fulfion sponsorship for participants (that countries

Yews

FY 1984 Science **Budget Overview**

Astronomy, engineering, and the physical sciences as a whole were among the best funded programs in the bacal 1984 budget that President Roughl Reagan sent to Con-gress last week. In addition, science education got a shot in the arm: The Reagan proposal includes plans for the nation's universities to apprade scientific instrumentation and to attract and support high caliber scientists and

Reagan proposes that federal funding for research and development, including R&D facilities, total \$47 billion to fiscal 1984, up 17% from the fiscal 1983 level. Defeuse research and development programs would be increased 29%; nondefense R&D would be increased 0.4%. Total basic research would be boosted 10%.

While support for science in general is strong, the budgets for the National Decanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USIS) have been cut, and the National Aertmantics and Space Administration (NASA) budget increase would be just short of fiscal 1484's projected 5% inflation rate. The National Science Foundation (NSF) purse, however, in-Creases about 18% in the proposed budget. NOAA's proposed liscal 1984 budget is

\$799.8 million, down 10.4% from the current plan for fiscal 1983. (NOAA is still operating on a comining resolution for the current fiscal year.) The main research thrust within the agency is down 9.2%. The budget properly calls for increases to the mapping, charting. and geodesy programs and requests a re-search program to predict global climate anomalies based on large-scale patterns of sea at NCAR surface temperature changes. Also proposed, bowever, are the closing the Great Lakes Environmental Laboratory and the 'deactivation' or represent of 10 of the 22 currently available ships. Two of these ships are research

ressers.

The USGS's proposed budget authority is approximately \$306 million, a 7% out from the fiscal 1983 budger plan. The agency plans to combute to expand its programs in strangic and critical minerals, acid rain, toxic wastes, and digital cartography data. A pro-gram-hy-program analysis will be published in Eas next week.

NASA's proposed budget, coming in at \$7.1 billion, shows an increase of almost 4% over the current fiscal year. Although NASA's budget boost only approaches the inflation rate, the monies will allow for modes expansion, primarily in space technology, physics and astronomy, and aeronautics re-

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Index

Terms

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Geoffrey Davies

members are as follows:

search and technology. Research and development is up 3%, while the proposal for construction of facilities rises a sharp 54.4%. With Congress' nod, the budget would replace the Venus Orbiting Imaging Radar (VOIR) mission with the Venus Radar Mapper, which would con about half as much

per, which would con about that as inferior VOIR. The Ventus Radar Mapper is one of four initiatives in NASA's budget.

At NSF, research and related activities are slated to go up 17.5%. Those directorates slated for the greatest R&D increases are mathematical and physical sciences; engineering; and astronomical, annospheric, earth, and ocean sciences. In addition, the budget proposal calls for research within the U.S. Amarctic Program to increase close to 25%. Science and engineering enfucation activities are budgeted for a 30% increase.

The shortage of university faculty receives attention in the budget through a Presidential Young Investigator Award program. To be administered by NSF, the awards are intended to attract to university research those new Ph.D.'s who might choose nonreaching careers in industry. The fiscal 1984 proposal would support about 200 new faculty at an average of \$30,000 per year for 5 years; the maximum award would be \$100,000 per year for 5 years.

In addition, approximately \$20 million has been allocated in the listal 1984 hudger for improving the science and math skills of secondary school reachers.

Next week, Eas will publish a more detailed analysis of how the Reagan budget proposal would affect geophysicists.—BTR

New Computer

Atmospheric scientists who have had to postpone analysis of their data for the lack of compiner resources may not have to wait much longer. The University Corporation for Atmospheric Research (UCAR) has awarded a \$4 million contract to Cray Research, Inc., for the installation of a second GRAY-IA computer system at the National Einter Ion Amuspheric Research (NCAR). A one-millim word CRAY system will be installed at the NCAR facility in Boulder, Colo., in the second quarter of 1983, according to a Cray

Machines of the capability of the CRAY have made possible many important advancer in the atmospheric sciences,' said Wilmot N. Hess, NCAR director and president of the AGU Atmospheric Sciences section. 'In the areas of climate research, oceanngraphy, serere storms, and stur-earth relationships, both

Andrew Nagy
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Douglas Torr (Atmospheric & Space Sciences) Centor for Atmospheric and Space Sciences UMC 34

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Res A. F. Spilhaus Jr. American Geophysical Union 2000 Florida Ave., N. W. Washington, DC 20009 (202) 462-0908

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AGU is revising its set of indexing terms. If you

have suggestions or comments, please contact the appropriate Journals Board member, AGU Journal Edi-

lor, or Associate Editor by February 28, 1988. AGU

proposes to coordinate its index with a revision of the AIP/APS-PACS index scheme (Phys. Rev. Lett., 48, 1,

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speed and memory arc of critical importance. Our first CRAY-1 [purchased in 1977] opened many research doors for us and our university colleagues. The second CRAY will serve many scientists who are waiting for additional resources,' he added.

NGAR conducts research in the annospheric sciences in conjunction with various universtries. NGAR is supported by the National Science Foundation and is operated by

IAGA News

Members of the International Association of Geomagnetism and Aeronomy [IAGA]
who have moved are asked to notify the IAGA secretary general of their change of address so that their copies of the IAGA News can be delivered. In addition, scientists whose professional work is related to IAGA's interests and who do not already receive the newsletter should contact N. Fukushima, IAGA Secretary General, Geophysics Research Laboratory, University of Tokyo, Tokyo 113, Ja-

Geophysicists

R. H. Augerer has resigned as vice president of Geophysical Systems Corporation in Pasadeua, Calif., to engage in geophysical and geological consulting as president of In-tegrated Exploration, Ioc., in Lakewood,

Joel S. Levine, of NASA's Langley Research Center, recently was awarded the Gregory and Freda Halpern Award in Photochemistry at the 165th annual business meeting of the New York Academy of Sciences. The award is sponsored by the Polychrome Corporation. Riccardo Gioconni, divector of the Space Telescope Science Institute at the Johns Hop-kins University, was bestured the A. Gressy Morrison Award in Natural Sciences. At the same meeting, Irwin I. Shapiro, at the Massachuseus Institute of Technology, was presented with the New York Academy of Sciences Award in Physical and Mathematical Sciences. Shapiro is un AGU Fellow. Also honored were Brure Murray and Frank Press (Eos, December 28, 1982, p. 1345).

Revent staff changes at the National Science Foundation include the following ap-Jarvis L. Moyers to program director of the

atmospheric chemistry program in the Grant Programs Section of the Division of Atmospheric Sciences. James B. Platner to section manager, Engi-

neering and Operations Section, Office of Scientific Ocean Drilling.

Dabra S. Stakes to program associate, Stib-marine Geology and Geophysics Program, Ocean Sciences Research Section, Division of

Ocean Sciences, George C. Stephens, to program associate, Polar Earth Sciences Program, Polar Science Section, Division of Polar Programs.

Mwil H. Manghani has returned to the University of Hawaii in Honolulu to continue his work as a professor of geophysics. He had been the director for one year of the experi-mental and theoretical geophysics program within the Division of Earth Sciences at the National Science Poundation. Michael Mayhew has been appointed as Manghaani's suc-

The following AGU members were hon-ored at the Geological Society of America (GSA) meeting in October in New Orleans: P.
Jonathan Patchott of the Max Planck Institute
was awarded the F. W. Glark Medal by the
Geochemical Society. Konrad B. Krauthopf of Stanford University was awarded the V. M. Goldschmidt Award by the Geochemical Society. Eugana M. Shoemaker of the Colifornia institute of Technology was awarded th GSA Day Medal. Robert Hazen of the Carnegie Institution's Geophysical Laboratory received the Mineralogical Society of America's MSA Award. Joseph V. Smith of the Universi-

ty of Chicago was presented with MSA's Roebling Medal.

J. Paul Riley was elected vice president of the American Water Resources Association. He is head of the hydrology and water re-sources division in the civil and environmental engineering department at Utah State University in Logan. Albert Rango was elected secretary of the association. Rango is head of the hydrological sciences branch at NASA's Goddard Space Flight Center.

In Memorian

Francis W. Reichelderfer, 87, dled January 26. The AGU Fellow reured as chief of the U.S. Weather Bureau in 1963; he had been appointed to the post in 1938. He joined the AGU Meteorology Section (now the Atmospheric Sciences Section) in 1939.

Request for Horton Research **Grant Proposals**

The American Geophysical Union is requesting proposals for the award of the Hortan Research Grant. The grant will be in support of research projects in hydrology and water resources by Ph.D. candidates of Amer-ican institutions of higher education and will be awarded annually to a single proponent. Its objective is to foster graduate student research leading to the completion of doctoral dissertations. Proposals may be in hydrology fineluding its physical, chemical, or biological aspects) or in the water resource policy sciences (including economics, systems analysis sociology, and lawl.

Proposals must be signed by both the sudent and the faculty research supervisor and must be received at the address below on or before April 1, 1983. The award will be in the amount of \$4,500 and will be made directly to the witner, selected by a committee of the Hydrology section during the 1983 Spring Meeting of the Union. For a detailed description of the Grand and a guide for pro-

> Hortoit Research Grant American Geophysical Union 2000 Florida Avenue, N.W. Washington, D.F. 20009

Geophysical Events

This is a summary of SEAN Bulleton, 7(12), December 31, 1982, a publication of the Smidsouian Institution, Both the Long Valley and Earthquake reports are excerpts; the Kilanea report was published in the January 25 issue of Eos. The complete bulletin is available in the unicrotiche crittion of Eoc. as a micredidle supplement, or as a paper repriot. Subscriptions to the SEAN hulletin are also available. For inicrohelie, order document E83-001 at \$1.00 from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, D.C. 20009. For reprints, ordet SEAN Bulletia (give dates and volume number) through AGU Separates; \$3.50 for the first copy for those who do not have a deposit account; \$2 for those who do; additional copies are \$1.00. For a subscription, order SEAN Bulletin from AGU Fulfillment. The price is \$18,00 for 12 monthly issues mailed to a United States address; \$28 (U.S.) if mailed elsewhere. Orders

Volcanic Events

Kilauca (Hawaii): Major eruption in middle of East Rift Zone.

Long Valley (California): Earthquake swarms and increased thermal activity. El Chichón (México): No new activity; aerosol

eloud continues dispersal.

Mt. St. Heleos (Washington): Deformation, seismicity, and SO₂ enrission quiet.

Langila (New Britain): Increasingly violent

vulcanian emptions. Manam (Bismarek Sea): Light ashfalls; increased seismicity.
Ulawun (New Britain): Vapor emissions for 3

Rusatu-Shirane (Japan): Volcanic tremor,

phreatic explosion Miyake-jima (İzu Is.): Earrhquake sequence

Sakurajima (Japan): Frequent explosive activity, ash ejection; little ash.
Ruapehu (New Zealand): Moderate inflation;

lake temperature lower.

Galunggung (Indonesia): Teplira ejection.

continues; new cone. lliboleng (Indonesia): Small ash eruption. Ema (Italy): Incandescent tephra from centrat crater.

Costa Rica: Activity at four volcanos summa-

Long Valley Caldern, California, USA (37.68°N, 118.86°W). All fintes are local (GMT-8h). The following is from the U.S. Geological Survey.

Earthquake swarms in the Long Valley area resumed in mid-December, after quiescence that lasted through most of November, On 14 December between 0056 and 0200, 200-300 small events were recorded; of which only about 10: could be located. These were centered at 2-3 km depth in the S part of the caldera, in the Casa Diablo epicentral area of rouny previous swarms. Spannodic tremor (produced by a series of earthquakes that occurs too rapidly to allow clear separation into discrete events on the seismic record) was recorded for the first time. since the 7-8 May swarm (see June 29. 1982, Eas). Increased thermal activity was noted along Hot Creek and near the epicentral area a few days before this swarm. Geyserlike activity at one Hot-Creek vent occasionally ejected hot water to about 10-m height, and water from

The state of the s

Faculty Position 12 Oceanography/University of Miant. Applications are invited for a tenured-carning faculty appointment in plin tical oceanography; level of appointment and salary commensurate with qualifia adout. Applicants should have a record of wholathy publications demonstrating the ability to interpret oceanographic dissivations, and several center reperience in planning and execution of oceanographic field experiments. Duties before excepting graduate level courses in physical oceanography and supervising research of graduate statements of three references as: Dr. Petedrich School, Chairman, Division of Aloteorology and Physical Oceanography, Rissenbird School of Manne and Atmospheric Science, University of Miant, 4800 Rickenbacker Capsesay, Miant, Florido 35149.

The University of Miant, Florido 35149.

another vent surged intermittently to

about 1.5-m leight.
On 21 December at 1428, two magnitude 3.3 esrthqunkes occurred at 6-km depth in the same epicentral area and were inllowed by a series of aftershocks. On 22 December, between 2140 and 2200, about 100 events were recorded outside the califera near Red Cones, two basaltic einder cones abnut 9 km. SW of the 14 and 21 December epicenters. Spasmodic tremor also accompanied this brief swarm.

On 6 January, 1983, at 1623, the most intense and prolonged swarm of earth-quakes since May 1980 began in the S moat of the caldera. During the first 12 liours, more than 1000 events were recorded, most in the Casa Diablo epicentral area; but with a secondary concentra tion near the caldera wall at Convict Creek (about 10 km to the ESE) and with many distributed between. Strong spasmodic tremor was mearly rontinuous during the first 12 hours. Two particularly strong shocks, of magnitudes 5.5 and 5.6 at 1738 and 1924, caused minor damage in Mammoth Lakes and disrupted electrical and telephone service for about an

During the first 36 hours, earthquakes of magnitude ≥1 were occurring at a rate of 80-100/hmur, those of magnitude ≥3 at 1-5/huur. During the succeeding 36 hours, the number of earthquakes gradually declined in about 15/ho paradic events of magnitude 3-3.5 contimed through 1200 on 10 January. As of 12 January, recurded evenus were cuntinuing at a rate of 4-5/hour, still above the normal background of about 50/day. Hypocenters thiring the swarm ranged from 10-kin to <3-kint depth, with most hetween d and 7 km.

Deformation (borehole tiltmeter, dry tilt, and gendimeter) measurements made during the swarm on 10-11 January suggest that uplift of the resurgent donic accompanied the swarm, but the exact amount awaits completion of remeasurement of selected parts of the leveling network. This, tagether with the concentration of seismicity in the S must and the absence of significant seismirity in the Sierra block S of the califera fluring this swarm, strongly suggests that the swarm was associated with magina morement at tlepth. Reoccupation of the geodimeter network in early December had shown no apparent change in deformation since the previous measureusems in Aogost (see SÉAN Bulletin, 7 (8)].

Information contacts: Roy Bailey, USGS, National Center, Reston, Virginia 22092 USA; Robert Cockerham, USCS, 345 Middlefield Road, Menlo Park, California 9-1025 USA; Francis Riley, USGS, Water Resources Division, Stop 404, Denver Federal Center, Box 25046, Denver, Colorado 80225 USA.

Meteoritic Events

Fireballs: Australia, central Europe, Italy, Spain, New England, Oregon, and the Middie Atlantic States.

Earthquakes

Estimates of the death soll in the December 13 earthquake range from 2000 to more than 3000. About 300 villages were destroyed or damaged, and 700,000 persons were left eless. On December 16 at least 500 were killed in Afghanistan, including six coal miners. More than 3000 were reported injured, and 7000 homes were destroyed. In Cuba, six were injured in the Havana-Matsuzas-Cienfuegos area. No damage or casualties were reported on December 19; the earthquake was in open ocean in the South Fiji Basin about 770 km SSE of Fiji. The December 25 shock killed 13, Injured nearly 400 (39 seriously), and damaged abont 1900 homes and 120 public buildings on the eastern part of Flores. It occurred beneath Adonora Island, just east of Flures, where clamage was also extensive. The December 29 earthquake in Yemen, in nearly the same place as the December 13 event, aus date, injured six and caused additional iluniest aftershock to

Information contacts: National Earthquake Infurmatiun Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25046, Denver, Colorculu 80225 USA; Moltammad Ali Mirza, Geological Survey of Pakistan, references to a greater extent than is desir-Quetta, Pakistan; Sanaa Dontestic Rudio Serable, a common defect of textbooks in my vice, Sanga, Yemen Arab Republic; TASS, Moscow, USSR: Karachi Domestic Radio Service, Karachi, Paklstan: Jakurta Oana Radio Service, Jakarta, Indonesla: National Broadabiquitous pocket calculators, lugh page costs, and slim budgets, one may certainly question the advisability of inclusion of an casting Company Television, New York, New York USA; Agence France-Presse; United Press International.

Alagni-tude

6.0 M

 $\frac{4.4 \ m_b}{7.7 \ M}$

5.6 M

5.l M.

Lati-tude

14.75°N

36.23°N

21.94°N

24.15°S

8.49°S

14.77°N

The Spindle Stage: **Principles and Practice**

F. D. Bloss, Cambridge University Press, New York, xii + 340 pp., 1981, \$69.95.

Reviewed by John L. Rosewield

When I published my first paper (Rosenfeld, 1950), one on what is now called the spindle stage, describing a simple device and conoscopic method for both orientation and meament of the principal refractive indices of an optically anisotropic crystal, the existing ninative methods were clumsy, slow, and subject to error. At that time, refractive indices, inadequate though they appear in hindsight, played a large role in determining the rompositions of nonopaque crystalline materials; and any improvement in optical methodology was welcome. The advent of the electron microprobe in the early sixties, capable of rapid and accurate chemical analysis, largely displaced the methods of chemical analysis relying on measurement of refractive indices. This change was reflected in many courses in optical mineralogy by deemphasis of the use of smelly and toxic refractive index liquids. The time freed was used for more intensive study of thin sections, a necessary kind of study for the fornulation of petrological problems if the electron probe is to be used effectively. However, the probe did not make use of the spindle stage totally obsolete for eronomic reasons and because, while the probe is essentially limited to determination

of elemental cumposition, the optical properties determined with the spintle stage reflect features of the structural state of the mitteral being examined and, in many cases, the valence state of contained elements. That knowledge can be useful to the petrologist. Further, for untwinned or singly twinned crystals a well-designed and well-constructed spindle stage on a good microscope is inherently superior to the more widely uscal universal stage because of low cost, accuracy, simpler geometry (with consequent need for few if any corrections in its application, and niuch greater procedural simplicity. As an ex-ample, a reasonably skilled microscopisi can use the spinille stage both to determine the composition and to discriminate among structural states for a plagiocluse feldspar grain in less than a hall-hour. But even for this last cask, the method of the spindle stage would seem to be inferior to that of X ray diffraction with regard to structural state. Thus, in perspective, the method of the spindle stage s elegant where optical properties constitute an end in themselves, but commonly achieves only 'quick and dirty' results where petrological goals dominate. I believe the petrological iterature reflects that perspective even though there are doubtless many papers that effect elaborate and cosdy methods when

tion the need for a whole book on the spindle

stage. I have viewed with an increasing sense

of deja vu the proliferation of papers on the

definitive paper by IVilcox [1959]. After that I

often expressed my views to sales representa-

should have been transferred to the manufac-

tives that development of the spindle stage

ment. Further, I pleaded that their micro-

utility with the spindle stage. An opaque

pliragm would, with appropriate eyepiece

Region

Yemen Arab Republic

northeast Afghanistan

Flores Is., Indonesia

Yemen Arab Republic

western Cuba

polarizing microscope. I have spr

Depth of

shallow shallow shallow

10 km

69.09°E

81,18°W

176.01°W

123.14°E

44.36°E

this latter arrangement, and it works

enford plate capability to maximize their

de stage since the appearance of the still

'quick and dirty' results would lisve been sufintroduction exposes the plans and the inficient for the task at hand. Placed in the above context, one may quer

ture, humidity, winds, precipitation, and sesummer rainfall increases from west to east across the city. The city is a urban-hent Island characterized by a humildity deficit. Severe weather events show a maximum in the re-

turers of their polarizing microscopes leading to production of well-designed spindle stages, compatible with their mechanical stages (for Climatic Changes centering and orientation), as optional equipscopes should have been provided with N/4 mask with an acentric target hole that could M.I. Budyko be inserted in the plane of the aperture dia-English Trans., R. Zolina reticle, allow conoscopic use of the spindle and stage axes as a two-circle reflection goniometer, thereby expanding the utility of the Bloss' book should be viewed in the above perspective. The book is essentially a self-conrained Introductory course in optical crystallography based on the spindle stage. The book is creditably free of obvinus errors. The book relies on derivative rather than primary experience, The book is well executed except for its probferation of detail. In this day of eight-page table of u-2 (pro rata \$1.65 worth 261名 and countries of the 等态的中枢的,也是一种实现 western South Paofic Ocean

of pages)! Also one may woulder whether discussion of a computer program (EXCALIBR available separately) for location of optic axes (34 p.: \$7.00) is an intracessary excrescence when simple projection techniques, also described in the book, give quick and satisfactorily accurate results at the work site.

Chapter I examines the in him boundary

layer. Arnonaleus summer values of differen

parameters including radiation and aerosol

city area are well documented. The tempera-

ture and lumidity anomalies over the div re

unit only motiveable at the surface but also an

peared in the height-averaged parameters.

the airflow mer the metropolitan area scene

4. Marked influences are visible: lirst clouds

appear over the center of the metropolitan

area and industrialized area. A downwind in

crease of cloud condensation nuclei of 94%

are unted. The author also points out theur

Chapter 5 deals with orban precipitation

rocesses, which are thoroughly detailed.

fall data, and also unmerical modeling. The

downwind rainfall maximum results from a

modification of humdary layer dynamics

from surface thermal and frictional forcing

fluences of pullutants and putential weather

modification agents. The St. Louis area emis

Ailken condensation nuclei which tend to ap-

proach normal concentration after 4-5 hour

a source of CCN. Dry deposition and chemi-

cal conversion remove softur clioxide emitted

The results of Metromex are summarized

in chapter 7, which gives a clear view of the

influence of a large urban area on the di-

mate. Chapter 8 is more economically orien-

tated. It tries to determine the impact of ur-

ban-modified precipitation condition on wa-

industry, ecology, Imman health, and activi-

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Cover. 'Cone A' (U.S. Geol. Surv. Bull.

1028-L) located in the southwest region of Okmok Caldera, Umnak Island, Alaska

Eruptions at the site of this cone occurre

in 1945, prompting the U.S. Geological

Survey, with the encouragement of the

then U.S. War Department, to initiate in

1946 its 'Alaska Volcano Investigadons'

Program. In 1978, new eruptions oc-

curred in Okmok Caldera, where a lava

flow from the Cone A site extended near

y the endre length of the caldera Hoor.

This photo was made in August 1980 dut

ing geophysical exploration work; such surveys are being conducted as part of the Geothermal Program in the Division of Geological and Geophysical Surveys of

ources, (Photo made and contributed by

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expressly stated,

ter resources, agriculture, business and

from the metropolitan area.

of downwind travel. The urban area was also

Chapter 5 is devoted to the study of their

e results are based on radar, surface raig-

bant effect on the droplet size spectrum.

to upolify the storm history.

The results indicate that the penetration of

Cloud characteristics are tested in chapter

concentrations in the boundary layer over the

At this time when publications must compete for the library dollar, book committees will want to reflect before including this expensive book on their purchase lists, Individual specialists whose work focuses on the aptical properties of non-opaque minerals will find that Bloss has covered the existing pullished meshodology rather thoroughly and therefore will want to purchase the bank or have it avaidable in their libraries.

References

Rosenfeld, J. L., Determination of all principal indices of refraction on difficultly oriented minerals by direct measurement, Am. Mineral., 35, 902-905, 1950. Wilcox, R. E., Use of spindle stage for deter-

ments, Am. Mineral., 44, 1272-1203, 1959. John L. Rosenfeld is with the Department of Earth and Space Sciences, University of California, Los Angeles.

mining refractive inclices of crystal frag-

Metromex: A Review and Summary

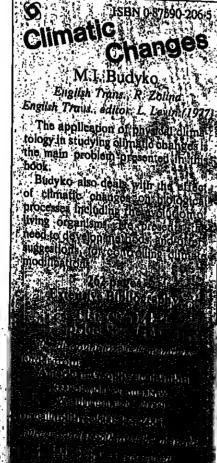
S. A. Changnon, Jr. (ed.), Meteoral. Monogr. 18, no. 40, American Meteorological Society, Boston, Mass., 181 pp., 1981.

Reviewed by D. Cadet

As stated in the title, this book reviews the Metropolitan Meteorological Experiment (Metromex) and summarizes the results obtained from an effort conducted over a 6year period by several institutions. Five authors, including J. Changnon, a well-recognized expert in the field, as an editor, contributed to this monograph. The experi-ment was designed to know how a large metropolitan area (St. Louis) in the humid continental climate zone of the central United States affects the summer atmosphere and how these alterations change the weather and influence man. The authors can be credited in writing a complete and detailed book in which the results are presented in a very tleductive manner. Each chapter begins with an

abstract that summarizes the main results. Prior to Metromex, some studies had own urban-related influences on climate. Some of the results were questionable and emphasized the need to evaluate inadvertent lification of the weather in the assessment of the environment. This finally resulted in the design of Metromex. The last part of the

In chapter 2 a detailed presentation of the surface weather conditions is given: temperavere weather parameters. It is found that the gion of maximum rainfall east of the city.



ties and atmospheric sciences. Summer weather changes increase local cloudiness (10%), total rainfall (30%), and severe storm activity up to (100%). The impact on water resources is also important; more runoff (11%), more local flouding (up to 100%), and more stream and ground pollution (up to 200%). Owing to increased orban-rela precipitation, an average increase of 3-4% in grain crop yields was noted as well as an increase of 100% in crop-hail losses. When all factors are considered, the impact resulting from the St. Louis area represents a net dis-

corum

AGU on Capitol Hill

I would like to take this opportunity to

commend and thank the American Gen-

physical Union for supporting a Congressional Science Fellowship. This year I had

when the AGU Congressional Science Fel-

low, George Shaw, spent the year in my

office. It has proven to be an exceptionally good and enlightening experience for me

and my staff and, I hope, for him as well.

value of having a scientist in the office for

a year, a skepticism which I suspect would

likely be shared by most Members of Con-

gress who rend to be steeped in the hu-

cism, I think, grows out of a prejudice:

manities or, worse, the law. That skepti-

that scientists are both too clinical and too

"ivory tower" to function well in the vis-

ceral and rough and tumble world of po-

I am very glad that I "hired" a science

fellow. I've learned many things about sci-

ence and scientists and have a much better

inpact of science and technology on pub-

appreciation for the significant potential

Further, I am now convinced of the

in the Congressional legislative process.

While the Committee staffs often heast

very capable scientists, it is extremely rare

to find technically or scientifically trained

people on the personal staffs of members

who, in fact, deal with technical issues all

work involves-as does granhage school-

long hours, lots of work, and low pay, the

individual Member of Congress seklom

has the ability to hire people with a ma-

mane and the process suffers for it.

tured scientific background. This is unfor-

However, in addition to being a ment-

ber of the House Energy and Commerce

Committee which deals with many techn

cal issues all the time. I'm a member of

the House Administration Committee. In

that capacity I will have a chance to raise

the issue of stalling in Congressional of-

ly trained staff. I imagine that, to date,

relatively few members realize the degree

to which stall numbers with a science or

technical background could improve the

AGU's Congressional Science Fellowship

program serves a very useful purpose in

making Members of Congress more aware

of the contributions scientists can make in

the legislative process. Beyond that, it also

The political process will be much better

serves to demonstrate that scientists, just

like lawyers, journalists, businessmen

farmers, and all the rest, can function

off when we develop a keener under-

standing of the utility of technical infor

mation to us and as we understand that

the scientist, too, can be politically savvy

When that is understood there will be a

much greater likelihood that science will

become better integrated in the decision

I would not want to ignore, either, the fact duat the scientist no doubt develops a

process. Taking that knowledge back into

the scientific continunities pays dividends

program is an excellent means of accom-

plishing these goals. It fills an immediate

which in my case bore directly on such Is-

AGU's Congressional Science Fellowship

better understanding of the legislative

making process than it is today.

as well, I'm sure.

very effectively in a political arena.

overall effectiveness of their offices.

AGU's Contribution

fices as it relates to the need for terbnical-

the time. Because Congressional staff

need for more technically trained people

litical policy making.

Today, I know that is pure hunk.

Value of the Science Fellow

I must admit I was skeptical as to the

my first experience with this program

D. Cadet is with the Department of Meteorology. Florida State University, Tallahassee, Florida.

Principles of Geodynamics

A. E. Scheidegger, 3rd ed., Springer-Verlag, New York, xvii + 395 pp., 1982, \$75.00.

Reviewed by Paul Morgan

Twenty years ago, when the second edition of Adrian Scheidegger's Principles of Geodynamics was published, the study of geodynamics, the internal processes of the earth, was a specialist subject. Within a decade, new and old concepts were pulled together in the unifying working hypothesis of plate tectonics, providing a global kinematic model of the upper layer of the earth. Much remains to be learned about geodynamics, but, during the last decade, in the framework of plate tectonics, it has become a valuable tool in our understanding of most dynamic geological proc-esses. In the preface of the third edition, Scheidegger states that, 'Although the headings of the chapters and sections are much the same as in previous editions, it will be found that most of the material is, in fact, new.' This new look at the subject is timely, because although many basic concepts of geodynamics have not changed in the past 20 years, our approach to these concepts has been radically reoriented.

The first two chapters of the text, almost one third of the book, present basic plasiographic, geological, and geophysical data for the carth. In this presentation there is a liberal sprinkling of global georlynamic hypotheses, both old and new, but no coherent treatment of the data. It is unfortunate that thiscussion of plate tectonics does not occur ontil chapter 6, as many of the data presented in the first two chapters are pieces of the puzzle for which plate tectonics provides an explanation. Twenty years ago these state would have presented a stimulating challenge for discussion in a graduate septinar. Tollay, as an introduction to the subject, the style is rather dated. A conscious effort has been made to update the material presented, although much emphasis is still placed on older studles, almost half the references in the linst chapter being pre-1963. Geodynamics has a great debt to the pioneering geologists and geophysicists, but for a reader in the 1980's, some of the concepts and hypotheses retained in Scheidegger's revision, such as the 'Terrahedral hypothesis,' an attempt to explain the global (fixed) distribution of continents and oceans, would better have been omitted, or relegated to a chapter on historical perspec-

Many details in the presentation and tliscussion of data in the first two chapters are misleading or Inaccurate. For example, it is implied that all batholiths are formed by anatexis (called 'metamorphose' in the text), the distinction between fold mountains and volcano/tectonic features such as the mid-ocean ridges is not clearly made, and seamounts are described as sinking under the extra weight that they create, with no reference to thermal subsidence, probably the dominating mechanism. No reference is made to the most important geological information to be gleaned from the oceans in the last decade and a half, the results of the Deep Sea Drilling Program.

The discussion of geophysical data is disap-pointing. Little new work is evident in the revision of the section on seismology, and it ignores much of the new evidence for the seismic character of the Molio and layering in the crust and upper mande that recent reflection and refraction studies have given us. A section on underground stresses, in common with many other sections, gives a summary of work in the field, but little analysis of the data or their implications. Much of the dis-cussion of heat flow data appears to be based on a globally smoothed representation of the data set, and the approximate equality of the means of continental and oceanic heat flows is explained in terms of butied radioactivity. a concept unnecessary and incompatible with seafloor spreading. The advances of the last 2 decades of our understanding of continental and oceanic heat flow and their relationship o geodynamics are largely ignored. Similarl the account of magnetic reversals and oceanic nagnetic lineations is poor and is followed by very short and incomplete discussion of electrical data. A brief section on geochemical data concludes the geophysical data presenta-tion, and although this section was revised from the second edition, some statements unortunately remain from a pre-plate tectonics understanding of the earth. In common with

soes as the Clean Air Act rewrite, sound nuclear waste disposal legislation, and the Alaska Natural Gas Transportation Sys-

tem, amung others. I personally hope that another Science Fellow will decide to spend next year in my office, providing the kind of expertise that I never had before and which, I'm afraid, I have come to depend on. Congratulations on your excellent program.

Alember of Congress

A Footnote

In most of my discussions with colleagues and others since returning from a year as the AGU Congressional Science Fellow, I have been asked "What is Congress really like?" The question always carries the implication that I should be able to reveal the seamy, inside clope on what a corrupt insulution it is. Two years ago I obahly would have asked the same ques-

tion, with the same implied cynicism. Fortunately, Congress is a far bener in stitution than the public thinks it is, and Congressman in general are far better than they get credit for. In fact I am convinced that Congress is the most underrated institution in the country. Members of Congress (M.C.'s) and Senators are bener informed and heighter than the average They work harder and under more dillicult combining than most people. And

they are dedicated to doing a good jub. If that is so, what is the origin of the general discontent with Congress? I don't have enough space or time to ileal with that question exhaustively, but I will cover a few points. I do this because those of us with information to ronvey be Congress will do a bener job if we have a more accurate perception of its numbers and a better appreciation of the problems they fare. Cymcally dismissing Congress as a bruch of venal incompetents will accomplish nothing. I offer three areas in which general perceptions are maccinate.

General Misperceptions

First, poll results indicate that by 3 to 1 votets rate Congress negatively but by a similar margin rate their own Congressman positively. Why the disparity? At the risk of stating the obvious, this is simply the cesoli of representative demorracy in a complex, pluralistic society. Your M.C. and Senators vote their constituency most of the time. But there are 434 other congressional districts and 49 other states with different makenps, and what is perceived to be in the 'national interest' in one part of the country clearly is often not perceived that way somewhere else. Your own representatives look good fighting for what you want against the interest o those bad actors in Congress who want

Second, we elect representatives to resolve issues through compromise and bargaining; the issues are tough and the compromises, however necessary, satisfy very few. Two hundred twenty million people cannot make the necessary bargains and tradcoffs on national issues. We ask Congress to do that. Then, naturally, we conplain about the results. But we also complain about the process; vote trading, logrolling, cutting deals, etc., all have negative connotations with the public. We crucify our representatives for one wrong yote, without asking or even caring why that vote was necessary or what trades were made. And if we do find out, we protest bitterly about the seaminess o trading rotes. How else, may I ask, are the compromises to be reached? I have observed Congressmen who are uncomprocolleagues except scorn. "If you're not

willing to move in my direction, I'll find someone else who will." Conflicts caustot be resolved (short of violence) unless people have the Hexibility to bargain, and for Congress that means vote trading, log-

Third, a common complaint these days

is that Congress doesn't ile anything. (There are those who rejoice in that!) This is more an inability to act than a desire not 10, and the problem, I believe, real. What is the problem? Surely there are enough critical issues to wairant Cougressional action. The main source of this problem is that Congress so accurately reflects the public mood. Totlay our society is highly polarized by a mancher of issues which have a high emotional content and which result in an either-or attitude. We have elected representatives who reflect our attitudes. They tend to be uncompromising, combative—and popular. This leads to a legislative situations which is more common now than it has been in the past-two strong, highly polarized factions aml a susall, weak middle ground. Since the middle is small and carries the swing votes, it is to the benefit of the two sides to pick away at these withle votes without compromising significantly. On any given issue, one side or the other may be successful at piccing together a hare majority, but with the expenditure of an enormous amount of time and energy, only to have the issue reversed by the slightest shift in vutes at some later time. This often results essentially in tro-real electricate. Neither side will compromise because they perceive their own strength as large enough to isrevail it only they can get a little piece of the center, and they perceive their positions to be pure, correct, and not to be compromised. The art of rounpromise is not dead. but it's certainly in had shape.

Dangers of Extremism

This country faces a number of serious problems, many of which have a high sciemilic and teclmical content. As scientists and citizens we want these problems (csolved with maximum awareness of the technical aspects. If we are going to make a contribution, we most have as clear and undistanted a view of the decision making process as we can possibly get. We can expect to influence the process if we are sen-sitive to the difficulties of our representatives and if we become more politically. aware. We cannot expect than the chosensolutions to problems will be reclimitally ierfect. We the not, thank goodness, live in a technocracy. My own state represemative (who is a scientist) once rold me [approximately], "You geologists amaze me when you treat this issue as if it should be resolved on a technical hasis. You do realize that it's actually going to be political." That is true, of course. Our job is to get the greatest possible degree of congruence between scientific and political reality. Our society will reflect our success or

Finally, I regard today's polarized political environment as unhealthy and a threat to our ability to readlye our problems. We most back off from polarized confrontations and reinvignrate the center. I am surprised, I confess, to find myself taking this position, but I have seen confrontational politics at work. It makes great the ater, but it doesn't get die job done. The election of more moderate representatives will improve the health of the body politic. Those groups (and I believe scientists qualify) who are accustomed to rational, balanced analysis in examining available information can help considerably to moderate the political climate, but only if they become more aware of the political process and get more involved in it.

University of Alianesota

much of the material presented before this section, a reorganized presentation of the data in a plate tectonic framework, rather than the 'agnostic' framework from the earler editions, would have improved these intro-ductory chapters considerably.

Chapter 3 outlines the theory of the me-chanics of deformation and, as in the previous editions, is an abrupt change in style from the data descriptions in the preceding chaptera. This chapter will be difficult reading for the less mathematically inclined scholar and would perhaps have been improved by the addition of more diagrams and examples to diustrate many of the concepts de-fined mathematically. The chapter is long and deals with concepts ranging from simple elasticity to nonlinear creep, ricelogy, fracture, and attenuation, in time frames ranging from those of seismie wave transmission to: isostatic rebound. Much of the material in this chapter is taken basically unchanged from the second edition of the text, with new sections added to elaborate on deformation in

beterogeneous materials, fracture, and elastic parameters. A short discussion of thermal vection is given, in which it is concluded that, 'The conditions for which thermal convection may occur are extremely narrow." This conclusion gives no hint of the intportance of thermal convection in heat transfer in the earth. The content of this chapter is basically sound, but it does not contain enough detail for specialist in this field, and would be a difficult introduction to the sub-

ject for a reader with a more general interest. Geodynamics of the earth as a planet, its shape, rotation, tides, origin, and evolution are discussed in the next two relatively short chapters. As much of the classical treatment of the enrth's global properties has not been; superceded in the last 20 years, only discussion of the earth's rotation and tidal effects have been significantly updated from earlier editions. The discussion of the evolution of many of the more surficial features of the earth, however, is out of date, and is again in places inaccurate. Few geologists who have

studied the problems of crustal evolution in the Precambrian would agree with Scheidegger's blunt statement in this section that terrestrial plate tectonics started 'at an instant 2 × 10° years ago.' In a discussion of the de-crease in continental heat flow with time since the last tectonic event, only the effects uf emsion are mentioned, the effects of lithospherie cooling and thickening which probably dominate in extensional tectonic events are ignored. A discussion of mantle convection currents and the formation of the continental crust is very out of date. The chapter concludes with a section on historical remarks on hypotheses of earth evolution, a section that would perhaps have been better placed earlier in the text, or even omitted.

Approximately half of chapter 6, entided Orogenesis, is dedicated to the concepts and mplications of plate tectonics. The remainder of the chapter discusses other, mostly older and now generally abandoned concepts and theories of orogenesis. As phale tectories has far greater implications to geodynamics

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the local application of geotlynamics, primarily material usually described as structural geology. These two chapters are the best part of the book and present a reasonable overview ol geodynamić processes on a local scale. Extensive reference lists are given in many of the sections, and large parts of these chapters show thorough and timely revisions from the earlier editions of the text. Chapter 7 discosses features associated with the regional stress field, and chapter 8 with loral instability phenomena, the theory of vokanie and impact features, and measurable vertical and horizontal crustal displacements. Most of the material in these two chapters is not treated in tletail, but with the reference lists make a good starting point for more detailed studies.

Almost 30 years has passed since Adrian Scheidegger wrote the lirst edition of this book, and he has made a valiant effort to revise the third edition to acknowledge the fundamental advances in the subject of the last 2 decades, Unicertainately, I feel that for much of the book, particularly for the global as-pects of geothynamics, he would have done better to reorganize completely the framework of his text or to make a fresh start. Scheidegger's style is at times rather stilted and is difficult to follow, especially when the discussion makes reference back and forth in earlier and later sections of the text. As in previous editions of this book, references are given as footnotes, which results in nutch repetition of the references and the loss of a comprehensive reference list. Adequate author and subject indexes provide a reasonable substitute for this list, however. Many references are in the non-English literature, which will limit their use as a source of further information for many readers. Understandably, Scheidegger referencea his own work extensively, although in some instances, for example, in the discussion of fault plane solutions, more lucid works have been published which would have made better references. I noted few typographical errors in the text, most of which were in the footnotes and were minor, but occasional discrepancies between the text and figures and undefined or remotely de-

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m Relation to Gondwarra Conf. James M. Schopl

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is unlikely that Principles of Geodynamics will fill the need for such a text. Different chapters of the book are written at different level rauging from introductory to senior/graduate, and, thua, even without its other faults, it would not make a good teaching text. At least two other texts have been published this year (1982) which give a more modern treatment of similar subject matter, and at \$75 it is unlikely that Scheidegger's text will fit into the personal hudgets of most researchers in this field. Adrian Scheidegger has made meny valuable contributions to both geodynamics and geomorphulogy, but it is with regret that I cannot recommend the third edition of Principles of Geodynamics as a gord modern text on geodynamics.

Institute, Houston, Texas.

Symposium on Polar Meteorology and Glaciology

K. Knsunoki (ed.), Alem. Nat. lust. of Polar Res., Spec. Issue, rol. 19, National Institute of Polar Research, Tokyo, Japan, iv + 320 pp.,

Research in Tokyo. The proceedings consist of 29 research papers. The papers are further divided into major groups of POLEX-Smith, POLEX-North, Antarctic aerosols,

The first seven papers report the meteorological observations at Syowa Station (69°00'S, 39°35'E) and Mizuho Station (70°42'S, 40°20'E, 2230 m MSL, 270 km inland from Syowa Station). Two papers by Yamanouchi et al. are concerned with radiometric measurements at Syowa and column water vapor amount at Mizuho. The total precipitable water at Mizuho in summer was 0.15 g/cm², and some diurnal variations were observed. The seven papers mainly elescribe the methods and preliminary results of meteorological observations as related to the POLEX-South project. Further interpretation, statistics, and discussions of the results are left for the fitture. The purpose of the observations alms at studying the heat budget of the eastern Ant-

The paper by Higuchi outlines the observa-tions of Aretic clouds and precipitations con-ducted in non-hern Canada in the winter of 1979-1980. The observations include fine structure of precipitating winter clouds by 8.6 mm rertically pointing radar, distribution, and change of precipitating clouds, using 5.2 cm short-range PPI radar and types and numbers of snow crystals as well as sampling of new snow for measurements of oxygen totopes and trace elements. The study of radars describes the relationship between radar echoes, ice crystals, and temperature profile of the aimosphere. The paper also reports dif-ferences between the levels of cloud top (defined from humidity more than 90% R.H. wrw) and radar echo tops. The oxygen isotope study tenda to determine the formation imperature range of snow. Yamamoto and

fined symbols in equations were more annoyon geodynamics is excellent. Unfortunately it

Geology of the Central Transantarctic Mountains

(1983) Edited by Mort D. Turner & John E. Splettstoesser

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Papers 1, 2, and 3, illustrated, 62 pages, \$12.95

Paul Morgan is with the Lunar and Planetary

Proceedings of the Third

Reviewed by Takeshi Ohtake

The sympusium was held on January 15-14, 1981, at the National Institute of Polar Antarctic precipitation physics, Lidar observa-tion, atmospheric circulation, oxygen isotopes, and glaciological studies in the Antare-

ice. After the clouds formed at a height of 70 m because of lowering sea surface temperature, more condensation of water vapor took place at the cloud top due to intense radiative cooling. Since the surface temperature remains at a constant value, lowering of cloud temperature results in an unstable condition of the amosphere below the clouds. This causes the transport of water vapor from the melting ice surface and accelerates the conmodel was made based on the vorticity equation by Sasaki and Imawaki. The stutly related to the general circulation patterns, i.e.,

I washima studied the variability of the Arctic temperature field as one of the most sensitive

> Iwai reports the frozen small raindrops of drizzle size at Syowa, which are considered to be produced by a coalescence and subsequent freezing of supercooled droplets. Kikuchi et al. made observations of precipitation intensity of snow crystals which were replicated by formrar solution. The intensities were determined by conventional empirical formulae as indicated by relations between size and mass of snow cryatals.

rate polar atratospheric aerosols and lonospherle phenomena in the middleupper atmosphere (10-120 km), a laser radar is to be installed in Syowa. Iwasaka et el. made preliminery observations with it at Nagoya, Japan, and succeasfully detected the volcanic aerosols from Mt. St. Helens several days after its eruption. The greatest observational effort by using the laser radar will be focused on aerosol transformations of sulfitric acid to ammonium aulfate in the polar atrosphere. I wasaka made e numerical estimation of stratospheric water vapor budget on a global scale through ice crystal growth in the polar winter atmosphere. Iwasaka et al. describe a preliminary experiment to utilize the technique of Lymanalpha line absorption to monitor a trace amount of water vapor in the polar middle atmosphere by en aircraft or

palloóne. Nakajima et al. compared meteorological conditions at Mizuho with those at Syona. The summer at both stations is characteristically less disturbed, while winter days are dominated by disturbances every 7-15 days. Yasunari has shown a predominant periodicity of 30-40 days of cloudiness fluctuation over India during the northern aummer monsoon period. This periodicity is triggered by a cold air outbreak toward the equator, as-

The species of the control of the co

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indicators of climatic changes and atmospher-

ic CO2. Numerical simulation of Arctic atratus

clouds is reported by Ohta. The paper claims

that the stratus clouds are generated by cool-

ing of warm moist air advected over the polar

densation. Another numerical simulation on

Fourier filtering in a barotropic Arctle ocean

global climatic changes. Takano explored a

formation of the Antarctic bottom water by

using a numerical model of oceanic general

The composition and origin of aerosols at Syowa are reported by Iwel et al. Most parti-

cles in winter (larger than 0.4 µm diameter)

summer were considered to be Ammonium

sulfate. The paper by Koule et al., however,

found the particles were mainly sea salt in all aeasons by using neutron activation chemical

analysis. The weight ratio Cl/Na for glunt

particles was larger than the hulk sea water

ratio. On the other hand, Ono et al. reported

that the high concentration of aerosols (amall-

er than above but larger than 0.004 µm di-

ozone value, i.e., not attributed to strato-

ameter) was not associated with high surface

apheric sources. Aerosol generation by photo-

chemical reaction in the Antarctic summer is

were identified as sea salt, while those in

possible effect of the bentropic mixing on the

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suciated with a westerly wave motion in the southern hemisphere. Such periodic fluctuations are found even at the 500 mbar level of Syowa. It is striking to know that the Asian nummer mountain is closely related with the hemispheric-scale wave mutions in the southern hemisphere.

The article of Kam describes the production rates of 14C and 32Si in the atmosphe in the Mauntler Minimum period (=Linle loc Age) (A.D. 1645-1717) related to the climatic change. Although the records of 14C concentration (by Eddy) agree to the date of the cold event, 12Si ilo not agree with the date. The paper discusses the cause of the discrepancy. The Kato and Watanabe paper discusses the way in obtain paleoclimatic information from the oxygen isotope data using the ke care sampled at Mizulin.

Aranka and Macunes' paper related to saltailing (=leaphig) of libraring now particles. Trajectories, fall relacties, and accelerations of flying snow particles were obtained by photographs. Watanahe and Kato analyzed oxygen isotope and snow stratigraphy of 2 m deep pits and 10 m deep rores sampled from the coast to Miznlic. They obtained a seasonal diagram of oxygen isotope raines of mow as a function of the elevations. From the sindy they are attempting in find a correlation between traygen isotope values and the glacinlogical environment. It seems elaborative work. Fujil observed snow surface conditions for the entire year of 1977 at Mizulm. which had snowfalls, sublimation, comicusation, and blowing snew. He found the mean annual balance of snow accumulation for 4 years was between 1.5 and 14.8 cm. A model of transmigration of surface condition is proposed. Another of Fujii's papers discusses seminunual variation of microparticle concentration in snow collected at Mizuho. The regional distribution of surface mass balance in Mizuho Plateau is reported by Yamada and Wakahanin based on the data accumulated for 10 years.

Takeshi Ohlahe is with the Geophysical Institute University of Alaska, Fairbanks, Alaska.



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POSITIONS AVAILABLE

Research/Senior Research Associate in Planetary Geology. A position is open for a planetary geologist/geophysicist at the Lunar and Planetary Laboratory, University of Arisona. The applicant should have a Ph.D. in geology or geophysics and research experience in impact cratering, including cratering mechanics and the planetary cratering record. A resume and three letters of reference should be sent to: Robert G. Strom. Lunar and Planetary Laborators. to: Robert G. Strom, Linar and Planetery Labora-tory, University of Arizona, Tucson, AZ 85721. The University of Arizona is an equal opportunit

Geophysicist/University of Montana. The Geology Department of the University of Montana is Inviting applications to fill a tenure track position at the assistant or associate professor level with a specialized area of geophysics beginning Sept. 1983. Teaching and research responsibilities at the undergraduate and graduate levels. Research interests should combine solid earth geophysics and geology. Applicant must have the Ph.D. degree or expect completion by summer 1983. Those interested should send a letter of application, resume, an outline of teaching and research interests and other relevant material. The applicants should arrange to have at least three letters of recommendation sent to: Arnold J. Silverman, Chairman, Department of Geology, University of Montana, Missoula, MT 59812.

The deadline for applications is March 15, 1983.

The deadline for applications is March 15, 1983. The University of Montana is an affirmative ac-

Franklin-and Marshall College/Petcologist. IVc have a 1-year position for the 1988-84 academic year with the possibility that the position may be extended for 1 additional year. The position its full-time involving up to 12 contact hours/semester. Candidates would tearly petrology (a one-semester combined igneous and nietamorphic course) and either economic geology or a course in their spetialty Candidates would also teach introductory physical geology once a year. Completion of Ph.D. prior to appointment is preferred but not essential. Franklin and Marshall College has an active geology department which consists of 7 full-time staff members and graduates 25 majors per year. Leathing and cesearch facilities are excellent including an automated XRF vacuum spectionierer. The college is a small (2000 sindents) four year liberal arts institution.

Candidates should send resume and arrange for 3 letters of reference and transcripts to be sent to:
Dr. Stanley A. Merizman, Chairman
Department of Geology
Franklin and Marshall College P.O. Box 3003

Lancaster, PA 1760-).
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Chemleal Oceanographer. Assistant Professor, tenure track position for applicates with recent Ph.D. and competence and interest in contempurary marine chemistry or geochemistry. Duties will include development of research projects and some teaching. Sulary negotiable depending upon experience and qualifications. Sidmit resume and names and addresses of three references by I March 1983 to: G. Ross Heath, Denn, School of Oceanography, Oregon State University, Corvallis, Oregon 97531.

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oppointment on or as even de possible affet 1 January 1994.

The University whehes to appoint an authanding geochemist of international stature in succession to professor L. H. Ahrens, the previous incumbent of the Chamber of Mines Chait in Seachemistry. Applications are invited from geochemists with tesserch experience and interests in any field of geochemistry. An exceptional research record and the proven oblitty to provide solenitific leadership of the highest author will be the most important criteria by which condidotes will be evaluated.

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The post is for permanent appaintment subject to a three-year probationary period. Appointment will be made according to qualifications and experience on the solary range R23 109 to R3O 226 per annum.

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Further Information may be obtained from the Registrar (Attention: Appointments Office), University of Cape Town, Private Sog, Rondeboech, 7700, South Africa.

whom applications (qualing ref BM/311) must be received not

ofer than 30 June 1983.

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Assistant Research Oceanographer/SiO. The Ocean Research Division of Scripps Institution of Oceanographs invites physical oceanographers to apply for a position as Assistant Research Oceanographer, the tesearch equivalent of Assistant Professor (Ph.D. in physical sciences or equivalent degree required). Candidate must have strong background in applied mathematics and fluid dynamics; stiming interest in ocean dynamics; and proven research and publication record in physical oceanography. This position is funded through ONR contract for two years. Appointment beyond two years is contingent on candidate obtaining extranural support. It is expected that the majority of research effort during the two years will be devoted to the theory and analysis of data on Kuroshio variability. Salary range is \$22,900-\$26,800 commensurate on qualifications. Position start date is approximately 4/1/83. Please send resume and at least three references to Dr. Russ Davis, Chairman, Ocean Research Division A030, Scripps Institution of Oceanography (Et. La Jolls, CA \$20093 by March 15, 1983. For additional information about the position contact Dr. Peter Niller (619) 452-4100. The University of California, San Diego is an Equal Opportunity/Affirmative Action Employer."

tion Employer."

Asslatant or Associate Professor/CSM. The Ceology Department of the Colorado School of Mines invites applications for a faculty position commencing September I, 1983 as Assistant or Associate Professor of Ceology in the specialty of Paleontology and Sedimentary Geology in cach courses at the undergraduate and graduate levels, direct theses and conduct research in these areas. The Ph.D. degree is required. Salary is dependent upon experience.

The deadline for applications is April 15, 1983. Resumes and references should be mailed to: Dr. J. Finney: Head, Geology Department: Colorado School of Mines: Golden, Colurado Rodol.

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Atmospheric Chemistry & Aeronomy Division (ACAD) and Scientific Computing Division (SCD)/
Ph.D. Scienda 1 or 11. The National Center for Atmospheric Research in Boulder, CO is seeking a second of the Control of the C Atmospheric Research in Boulder, CO is seeking a scientist to establish and manage the scientific research in Incuberon Scatter Radar data base. Will interart with user and radar community to enablish research project to insure appropriate scientific use of data base. Position requirements include Ph.D. degree or equivalent, research experience in aeronomy physics, electronic engineering, annospheric science, or closely related field. Familiarity with the furtherent Scatter Radar techniques for measuring the properties of the ionosphere, magnetistylese, and atmosphere. Demonstrated high level of skills in arleanced FORTRAN programming, munctival modeling data reclution techniques, (levi 111) requires national acientific recognition and demonstrated leadership skills in and promoting Incoherent Scatter Radar research. This is a crut position subject to animal review and communed lunding for project, Sciul restance PROMPTCA to Esther Radaron, NCAR, P.O. Box 3001, Bonblet, CO 80307 of call SUS-EM-2011 ext. 501 got information. NCAR is an equal opportunity/alliquative action

Naval Postgraduate School. The Department of Oveanography invites applications for the position of Adjutta Research Professor in the Ocean Turbulence Laboratory. The successful applicant will be responsible for the organization and recention of eccanic turbulence the attrements as well as the interpretation and reporting in the obtained data. The position requires a Ph.D. or equivalent in Physical Oceanography, 3 years of post-doctoral experience will oceanic measurement and data interpretation, and some familiarity with turbulence instrumentation. The Ocean Turbulence Laboratory is artively engaged in the inessurement and interpretation of oceanic turbulence data from a variety of environment obtained with acceptative of vehicles. The successful candidate will be expected to contribute to the growth and development of the scope of the research performed by the laboratury.

Applicants should send a resume, statement of research record and interest, and the names of at least three references to, prof. Thomas R. Osborn, Code 680r, Nmal Postgraduate School, Monterey, CA 03040.

Applications will be considered until March 8, 1983. Application will be considered until March 8, 1983. Application in the professor Christopher N. K. Moocia, Clearman, Department of Oceanography, Naval Postgraduate School, Monterey, CA 93940. Phone: (408) 646-2952/2553.

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Faculty Poshlon/Princeton University Department of Geological and Geophysical Sciences. We are looking for an exceptionally creative individual in the general area of paleontology—stratigraphy—sedimentology for tenure-track appointment as Assistant Professor. Rapid increases in understamiling of the processes and history of the carth's surficial environment have come about through analytical and dicoretical atlyances in many specialides, soch as magnetic stratigraphy, clay uninetalogy and seeas magnetic stratigraphy, clay inineralogy and geo-eheerisity, seismic stratigraphy, isotopic and micro analytical studies of fossils and sediments, sedimen analytical studies of fossils and sediments, sedimentadon related to crustal tectonics, and mathematical analysis of stratigraphic and paleontulogical tlata. We seek candidates with strong interdisciplinary research interest in areas such as those listed, with the analytical skills and foresight to work effectively on the frontier. Within the department, the appointee should be able to take responsibility for an area such as stratigraphy, paleontology, or sedimentology, and provide a broad historical perspective. We plan to back up this appointment by our program for a general expansion of laboratory facilities, as appropriate.

for a general expansion of laboratory lacilities, as appropriate.
Inquiries should be made to: R. A. Phinney, chairman, at the above address, or by phone, (609) 452-4100. While later applications will be considered, we would like to have them by the 31st of January, 1983, or earlier, if possible. Applicants should submit: resume, names of at least three references, and a satement of research plans and priorities.

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Iowa State University of Science and Technology, Department of Earth Sciences/Faculty Positional, Applications are invited for a tenure-track faculty position in mineral resources. Rank is at the assistant or associate professor level, dependent appointment of the second publications. The successful applicant will be expected to depole a streng result and assistant or associate professor level, and applicant will be expected to depole a streng result and assistant or associated to depole a streng result and assistant or associated to depole a streng result and assistant or associated and assistant or associated to depole as a streng result and assistant or associated to a strength assistant or associated to a strength and assistant or associated to a strength assistant or associated to a strength and assistant or associated to a strength and assistant or associated to a strength assistant or associated to a strength and assistant or associated to a strength assistant or associated to a strength and assistant or associated to a strength assistant or associated to a quantizations. The successful applicant will be ex-pected to thereby a strong research and graduale student program in mineral resources/cromanic ge-ulogy and will teach undergraduate and graduate comises in this subject. An applied field orientation is projected.

is preferred.

Luva State has established a Mining and Mineral Resources Research Institute in order to supplate and develop research and education in mineral resources. An interdepartmental graduate minor in Mineral Resources has also been established. In additional forms of the programment of Earth tion to the appointment in the Department of Earth Sciences, there will be full opportunities to interact

with these programs.

Completion of the Ph.D. prior to appointment is strongly preferred. In addition, research addity shown by other publications ant/or positiortoral or industrial experience will be an advantage. The position is currently available and is expected to begin to later than September 1988. For application information, advance with the formation, please write to: Berg E. Nordlie, Chairman

Department of Farth Sciences 253 Science I hos, Salo University Ames, lowa 50011 Iowa State University is an equal opportunity af-

firmative action employer

Marine Geophyaleist/Texas A&M University. The Department of Decanography of Texas A&M University will have an opening for a tenure track laculty member in Marine Geophysics beginning September 1985. Preference will be given to candidates with a trong quantitative bud ground in a widering of geophysical topics and who have both interest and experience in marine expluration.

The intressful applicant will be expected to teach undergraduate and graduate courses and to toudurt a vigorous research program in his or her sperialty. The position is to be filled at the level of Assistant Professor. A Ph.D. is required for this position. Salary is negotiable depending upon experience and qualifications.

Applicants should submit a vita along with a letter describing his/her research and teaching goals and names of five persons for reference to Professor R. O. Reid, Head, Department of Occanography, Texas A&M University, College Station, T.X. 77843. The closing date for applications is March 15, 1983. Texas A&M University is an affirmative action/equal opportunity employer.

Postdoctoral Research Associate Mineralogy. Applications are invited for research in high-resolution and malytical transmission electron microscopy of minerals and their analogues. Experience in crystallography, materials sciences, or electron microscopy is desirable. Send resume finelluding transcriptsi, statement of research interests, and names of three references to Dr. P. R. Suseck, Department of Geology, Arizona State University, Tempe, AZ 85287. ASU is an EO/AA employer.

AMOCO Foundation Ph.D. Fellowship Department of Geology University of Missouri-Columbia

The Department of Geology Invites applications for the Amoco Foundation Fallowship to support an outstanding Ph.D. Candidate in any subdiscipline of geology. This 3-year lellowship includes a generous stipend, waiver of tuition and fees, and substantial funding to support research. The Department of Geology has dynamic research programs in aedimentology, sedimentary petrology, low temperature geochsmistry, iscionics, geophysics, paleoniology, and igneous and maternorphic petrolo-

For application materials and additional Information contact:

Director of Graduate Studies Department of Geology University of Misaouri-Columbia Columbia, MO 65211 The deadline for application is March 1, 1983.

Geophysicists/Institute for Geophysica, University of Texas at Austin. Applications are invited for research scientists with a Ph.D. In the general areas of marine geophysics or theoretical seismology. We are particularly interested in impossible indicatingles who wish to pursue a career primarily in research with some teaching and graduate sudent responsi-bilities. The tustique is located in Austin and operwith some teaching and grathfulle student responsibilities. The traition is located in Austin and operacies of the University. It is a vigorous and growing group with Interests in bath land and marine grophysics. Research facilities include a 167° ship equipped with state-of-the-art multichannel and high testidution seismit reflection and OBS seismit refraction capabilities.

Applicants should have a demonstrated ability to be creative research, Both middancer and recent Ph Its are encouraged to apply. Applicants should automit resume, the manes of at least to ee tefferences and a statement of recording time.

ences and a statement of research plans and prior-

A. E. Maxwell, Director A. E. Maxwell, priction
Institute of Geophysics
University of Texas at Austin
Autifit, TX 78712.
While late applicages will be considered, we prefer
to those applications in hand be April 13, 1983.
The University of Texas is an equal opportunity
affirmative action employee. affirmative action employer.

Isotope Geologist/University of Wyoming. The Department of Geology/Geophysics invites applications for a tenure track position at the assistant professor level in hotope geology. The applicant's field of specialty may be stable or radiogenic isotopes. The successful candidate will be expected to teach undergraduate and graduate courses and conduct his/her own research program.

Cutrent research at the University of Wyoming inclodes: cristal evolution in the Archean and Proferozoic; the systematics of magma routantination; carbonate diagenesis; fluid-rork interaction; and the tectonic evolution of compressional and extensional orogenic belts. We hope the successful candidate wilt complement these studies as well as develop a strong, independent program. Applicants should submit a vita, transcripts, a letter describing future research interest, and names of three references to Dr. Robert S. Houston, Head, Dept. of Geology/Geophysics, PO Box 3008, University Station, University of Wyoming, Laramie, Wy 8207 t. Closing date for applications is February 28, 1983.

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SENIOR RESEARCH SCIENTIST/TRAINING MANAGEMENT POSITION International Ground Water Modeling Center

position will become available July 1, 1983 for a Senior Geohydrologiat to direct the International Ground Weter Modeling Center (IGWMC) at Butler University a Holeomb Resserch Institute in Indienepolis, Indiene, USA. The IGWMC is an international information and training center for ground water modeling which conducts a program in applied research on ground water modeling, organizes an annual series of short courses, provides assistance in workshops and aeminers, operates a clearinghouse for ground weter models, and publishes the Ground Water Modeling Nawsistter. Negotiations era currently underwey to initiate IGWMC ectivities in cooperation with the Outch research organization TNO by opening an office in Delft, The Netherlends, in late 1983. An international policy group, assisted by en international advisory committee, providea oversight to IGWMC.

The aucceasful applicant will have a background in ground weter hydrology prafarably at the Ph.D. level. He or she must possess a minimum of five yeers experience in conducting studies of quantity end quelity of ground water rasources and should be acquainted with theory and epplication of modern ground weter modeling techniques. Experience in project management and training/education is preferred.

As the senior management person in the HRI-IGWMC office, the incumbent will manage the daily activities of the Indianapolla office of IGWMC. Mejor duties of the position include planning and implementing IGWMC activities in the North, Centrel and South American region, fsellitating information tesks of the centse, which include initializing and maintaining contacts with ground water modalers, reaearchera, field techniciens and weter resources mensgars. Incumbent will also provide oversight of end perticipation in the Center's training programs end all technical teaks for the Canter. Person will serve as general ground water specialist for other HRI environmental research programs.

Persona Interested in applying for the position should, before Merch 31, 1983, send curriculum vite and names of three professional raferences to:

Oarrell R. Fishel Business Manager Holcomb Rasearch Institute Butler University Indlenapolis, Indlans 46208

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state Crist, CA 95001. The University of California is an equal opportunity affirmative action couployer. The Pennsylvanía State University/Faculty, Posltions. The Department of Ceosciences Invites applications for three (3) tenure track faculty positions, which are expected to remain open until filled by outstanding geoscientism in any of several fields of specialization. The faculty rank associated with each position is presently open, although salary funds currently available are sufficient for st most une senior full professorship, Salaries, which are competitive, will be cummensurate with the experience and qualifications of the appointees. The successful candidates must be, or have demonstrated the potentials to become, nationally recognized leaders in their fields. They munt also have an interest in their fields. They munt also have an interest in their fields. They munt also have an interest in teaching and advising graduate and undergraduate students. Persons having an interest in collaborative research with other department faculty are preferred. Instructional and research areas in whiri particular needs have been identified Include, but are not necessarily limited to: aqueous geochemotry, with emphasis on low-temperature rock-water (gmuntiwater) interactions; have faculty applications; between themselves and their geokujicul applications; fectomore, with emphasis on global geophysical and geological pracesses and abservable manifestations of them; welmentary geochemisty, with emphasis on petrology or rlay minesality; who emphasis on petrology or rlay minesality; well applications of crystellochemical methods; and modeling of dynamical earth processes using apinquiate physical and mathematical representations.

The selection of persons to till these three positions.

lions.

The selection of persons to fill these three post-ions will be based in part on the extent in which their future research elforts will complement and futher strengthen our programs in Geochemistry and Mineralogy, Geology, and Geophysirs. Quali-fied persons aboutly, therefore, include a brief de-scription of their futore research objectives with their resumés and the names of three references, and sand to:

L. Wayne Burnham, Head The Pennsylvinia State Pulsary Place Pennsylvinia Scale University
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University of Kentucky/Department of Geology. The Department of Geology Invites applications for two tenured track Assistant Professor level positions. Both appointments are for soft took geologists perferably with some experience in industry and interests fucluding one of the following: sell-intentiology, stratigraphy, carbonate periology, organic geochemistry, or ismope geology. The successful applicants would be required to participate in active research, supervise graduates. Familiarity with quantitative techniques is desired; Department has access to a variety of computational devices. Academic vitate and names of three references should be sent to Dr. Lyle Sendlein. Chalman, Seatch Committee, 321 Patterson. Office Tower, University of Kentucky, Lexington, Kentucky 40506-0027. Closing date is March 1, 1983. Both appointments are to commente in August 1985, but an callicidate may be considered. Safary is negociable.

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Yale University. The Department of Geology and

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Yale University. The Department of Geology and Geophysics solicits applications for a senior faculty position in stable isotope geochemium, with emplasis on one deposits. Applicants should have at least five years research and teaching especience beyond the Ph.D., with emphasis on the use of the light stable isotopes in petrology, tectouies, sedimentology and paleobinlegy as well as one mineral deposits. Yale University is an equal inponunity/affirmative action employer and encourages worken and members of minority groups to compete for this position.

sition.

Curriculum vitae, publications, and the names of three or more referrers should he sent by April 1, 1983 to: Karf K. Turckian, Chairman, Department of Grology and Geophysics, P.O. 80x 6666, New Hareo, CT B6511.

Postdoctoral Position in Dynamical Meteorology. The Department of Ammspherit. Sciences at the University of Washington announces a research position for work on problems of large-scale dynamics and transport in the stratosphere and mesosphere. The successful applicant should have demonstrated capability in diagnosite studies of amospheric circulation and/or in dynamical theory, and modeling. Position is for one year with possibility of extension to three years and begins about July 1, 1983. Candidates about four learning the curriculum vitae and direct letter of ceference to:

of reference in:

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Department of Atmospheric Sciences AK-40
University of Washington
Scaule, WA 98195
For Information plane 2015-143-1932.
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ENGINEER III (Geothermal Systems)

MS in Chamical or Mechanical Engineering plut 2 yrs, of experience or any equivalent combination of education and experience which provides the following knowledge of geothermal exploration and hydrology, multi-phase process ploing and heat exchonger design, engineering cost enelysis, construction codes and standards, and design of simulation models to test affects of local, stens and isderal taxelion policies on elternative energy devalopment, and APL programming; and ability to supervise. Salary is \$22,956 and up OOE. Deadline is February 22, refer to position 194. Passonnal Department 1194-531; Physical Science Laboralory/NMSU; P.O. Box 3548; An Affirmative Action/Equal Opportunity Employer;

Physical Science Laboratory

Department of Geology/The University of Albertu. The Geology Department has a tenure-track faculty position available from July 1, 1983. We interpreted individuals for appointment at the Assistant Professor level in the nite applications from qualified individuals for appointment at the Assistant Professor level in the
field of Stratigraphy. Preference will be given to applicant who demonstrate an ability to pursue a vigorous research program applying modern concepts
and techniques in solving problems relevant to Petroleum Geology. The candidate is expected to
teach advanced undergraduate courses in Stratigraphy and course(s) in his or her speciality, and to supervise M.Sc. and Ph.D. students. A Ph.D. is required. Current Assistant Professor salary range:
\$27,720.\$39,820.
Interested applicants should submit a resome,
publications, proposed tesearch, and names and addresses of three referees to fir. N.W. Rutter, Clairman, Department of Geology, University of Alberta,

dresses of three referees to Hr. N. W. Killer, Chairman, Department of Geology, University of Alberta, Edmonton, Alberta, Canada T6G 2ES. Closing date for applications is March 15, 1983.

The University of Alberta is an equal opportunity employer but, in accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada.

Research Associate/Upper Atmospheric Phys-ics. The National Research Council (Canada) is Ics. The National Research Council (Canada) is building a multi-instrument ground based research facility called CANOPUS. One part of CANOPUS is a Data Analysis Network which will provide interactive access to the CANOPUS data by scientists scross Canada. A research associate position exists for a person who would be associated with implementing and operating this network. This position will allow some independent research on aspects of the CANOPUS data and the holder of the position would be encouraged to undertake such research. The position requires a Ph.D. In some aspect of upper atmosuberic physics (preferably ground)

The position requires a Ph.D. In some aspect of upper atmospheric physics (preferably ground based) and extensive computer esperience. Any related experience in computer networking, etc. would be an advanage. The initial salary will be in the range from \$24,000 to \$27,000 per year, depending out experience. The appointment will be initially made for two years and commettees as soon as toxible.

as possible. Send renumes and the names of three referees to:

Professor J. A. Koehler Institute of Space and Atmospheric Studies University of Saskatchewan Saskatooti, Saskatchewan S7N 0W0 Canada.

Faculty Poaltlon/Department of Geology, University of Illicola at Urbana-Champatga. Applications are solicited for a tenure track assistant professor position in experimental rock physics. The position is especied to be filled by August 1983. Salary it open depending upon experience, We are seeking a treatire individual who is interested in either bisinle in hardle behavior of rocks and their geological applications. An earned Ph.D. Is required. The Department of Geology, the Materials Research Laboratory and the Engineering College of the University together offer excellent research facilities for rock physics studies. For equal considerations, interested individuals should scul curriculum vitae, list of publications, esearch luctesis and the names of three or more references by March 5, 1983 in:

Alleet T. Hsui

Department of Geology

University of Illinois at Urbana-Champaign

1301 West Green Steet

Urbana-Champaign

217-333-7732.

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THEORETICAL OR **EXPERIMENTAL SPACE PLASMA PHYSICISTS**

NASA-MARSHALL SPACE FLIGHT CENTER Huntsville, Alabama 35812

Two positions in theoretical or experimental space plasma physics are available in the Magnetospheric Physics Branch of the Space Science Laboratory at NASA's Marshall Space Flight Center. Either theoretical or axperimental backgrounds will be considered with a preference given to theoretically oriented rasearchers to complement the extansiva experimental activities of the branch. The Magnetospheric Physics Branch is involved in the analysis of lowenergy plasma deta from the ISEE, SCATHA, and Dynamics Explorer satellites, from sounding rockets, and from the Space Shuttla (STS-3). In addition, the group is presently carrying out the joint development of a variety of ective space plasma experiments that will be flown on Spaceleb One, Two, and Six.

Salerles range from \$34,930 to \$41,277 per annum, depending on experienca.

Interested epplicants may contact Dr. Charles R. Chappell at the Marshell Space Flight Center (205-453-3036). Forward resumes to the following eddress not later than March 1, 1983:

NASA-Marshall Space Flight Center Space Science Laboratory Attn: Dr. Charles R. Chappell, ES51-R2 Huntsville, AL 35812

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Research Scientist/Marine Geophysicist

Selary: \$25,315 to \$47,088 Ref. No.: 82-NCRSO-EMR-19 (4011)

Energy, Mines and Resources Canada Geological Survey of Canade Dartmouth, Nova Scotla

The Geological Survey of Canada le seeking e creative geophysicist to carry out original end cooperative research programe. These programe relate to geophysical studies of the earth end its tectonic processes, particularly by the development a models where euch programs have specific applications to the practical consequences of continental margin development, such as ite resource potential. Some research programs may be totally independent, but others must provide theoretical geophysical input to programs already underway et the Atlantic Geoscience Centre. These programs are directed towards the investigation ot the etructure and origin of continental margins off Eastern Canade and the Arctic, basin anelyeis and hydrocarbon inventory of Eastern Canada, and quaternary marine geological processes. The acientist must exhibit originality, creativity, initiative and cooperativeness in carrying out such work and must communicate its resulte effectively.

Qualifications

Graduation from a recognized university with a dociorate degree in geophysics, geology, physics,

methematics or e related tield; or a lesser degree with research experience and eclentific productivity equivalent to thet of a doctorete degree.

Clearance number: 112-299-012

Languege requirements Knowledge of English is essential.

Additional job information is available by writing to the address below. Tout renseignement reletif à ce conoours est disponible en trançais et peut être obtenu en écrivant à l'edressa eutvante:

How to apply Send your application and/or réeumê to: Joan Girling Nationet Cepital Region Staffing Office Public Service Commission of Canada 300 Laurier Avenue West Ottawe, Ontario KIA 0M7 Tet.: (813) 593-5331, Ext. 403 Closing Date: March 18, 1983.

Please quote the applicable reference number at all times.

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Physical Oceanographer/Computer Programmer. The Florida State University is seeking applicants to help carry out advanced research that involves numerical modeling and time series analysis. Candidates should have an M.S. in physical oceanography or computer seience and experience with principles of ocean circulation modeling and oceanographic data processing. Experience on CDC mainfrances plus Fortran IV is particularly desirable. Pusition available to start institutionly. Rank is Research Assistant. Salary will be competitive acrording to training and experience. Send resume and professional references by March 28, 1983 to Y. Hsuch, Department of Oceanography, Florida State Hauch, Department of Oceanography, Florida State University, An afficmative action/equal opportunity

Faculty Positions/The University of Iowa. The Department of Physics and Astronomy, anticipates one or two openings for tenure-track assistant professors or visiting professors of any rank in August 1983. Preference will be given to experimentalisis in any area for the tenure-track positions. Current research interests include astronomy, atomic, condensed matter, elementary partire, laser, nuclear, plasma, and space physics. The positions involve ondergraduate and graduate teaching, guidance of research students, and personal research, interested persons should send a resume and a statement of research interests, and have three letters of recommendation sent to Search Committee, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242. City, IA 52242.

The University of Iowa is an equal opportunity/

Virginia Polytechnic Institute and State University/Structural Geologist. The Department of Geological Sciences invites applications for a tenure-track position in Structural Geology at the Assistant or Associate Professor level. The position involves teaching at the graduate and undergraduate level and supervision of graduate student research. Candidates should be process-oriented with interests in field related problems. A Ph.D. and strong research potential are required. Closing date for applications is April 15. The position is available from September 1, 1983.

To apply send a vita with list of publications, summary of present and proposed research and the names of three references to: Kenneth A. Eriksson, Chairman of Search Committee, Department of Geological Sciences, VPI & SU, Blacksburg, VA 24061.

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Position in Petrology/Rice University, Houston, Texas. The Department of Geology has a tenore-track opening beginning Joly 1983 with starting level of appointment depending on the experience of the candidate. The faculty member is especial to establish, or continue a vigorous research program in petrology and 10 participate in teaching in mineralogy-petrology. Research preas in which we are potentially interested include: igneous petrology, metamorphic petrology, or the position, especialises are not excluded from consideration, especialises are not excluded from consideration. Available research facilities of the Department include: electron-microprobe, ICP-specingraph. Ar-Ar dating, and stable light isotope mass-spectrometry. Send curricultury viace, a statement of planted research, and names af at least three-references to Dr. A. W. 9ally, Chairman, Department of Geology, Rice University, P.O. Box 1892, Hauston, Texas 77251.

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Tectonic modeling
Seismic data processing
Contact: Dr. Kevin P. Furlong
Dept. of Geology/Geophysics
University of Wyoming
PO 90s 5006 Univ. Station
Latamie, WY 82071

uliration please write:

Gradoate Fellowablps In Coastal and Confinental Shelf Sedimentetion. The Geology Department of Dalhousie University invites applications for graduate fellowships leading to M.Sc. and Ph.D. degrees with specialization in the field of coastal and continental shelf sedimentation. Potential research areas include shoreface and sediment processes, instrumentation for sediment transport studies and roustruction of coastal facies modes. Oppurimities exist to take part in the upcoming Causadian Coastal Sediment Study and to gain scientific cruise especience on research vessels from Geofford Institute of Oceanography. Awards over a calendar year stiperul and ale valued, alter fees are deducted, between \$5000-\$9000t. For further information or application please write:

Gerdogy Repartment Dalhousie Duitersity Halifas, Nora Scutta CANADA 03H 315.

Graduate Research Assistantables Available/De-partment of Meteorology, South Dakota School of Mines and Technology. Several graduate research assistantiships are available beginning Fall 1983 in the areas of numerical cloud modeling, cloud phys-ics, weather modification, radiative mansfer, tadar atereorology, mesoareteorology, and air pollution chemistry and physics. Graduate study can lead to a

Master of Science degree in Meteorology at SDSM&T as well as a Ph.D. through a cooperasive program with Colorado State University. Current areas of research emphasis include: 1) numerical cloud modeling at the single-cloud and mesoscale level, including acid rain formation, 2) design and evaluation of field experiments and operations in weather modification, including half suppression, 3) aircraft and rattar investigations of thoralerstorms, 4) radiation and retunte sensing from satellites, 5) mesoscale data analysis, and 6) analysis and anurce appartionment of aimosphetic particulate matter. Stipends for the nine-month academic year vary from \$4.400 to \$5,600. Full-time summer employment generally in available. For further information contact Dr. Oriant L. Davis, Acting Head, De partment of Meteorology, South Dakota School of Mines and Technology, Rapid City, South Dakota \$7701-3995 (telephone 605/394-2291).

SERVICES, SUPPLIES, COURSES, AND

Strain Measurement: Techniques and Tectonies Implications, Sponsoced by the Structural Geology and Tectonics Division. J.G. Rantsay: Geologisches Institut, ETFI Zentrum Zurich, Switzerland and R. Kligfield, Department of Geological Sciences, University of Colorado, Boisider, Colorado, USA.

University of Colorado, Boisider, Colorado, USA.

Over the past ten years many new practical sechniques for measuring rock strain have been developed and, as a cesuli of these studies, major advances have been made in our understanding of the significance of small and large scale features of rectonically definition for the state of the significance of small and large scale features of rectonically definitions in the left and in the laboratory. Particular emphasis will be given to an analysis of strain variation over a wide range of scales and to a discussion of the significance of these transitions in terms at tectoritis processes.

The course will begin on Thursday evening, Notenther 3, and will emf at mean on Samurlary, Notenther 5, fectures and workshops will be held at the hidiana Memorial Union. University of Itoliana, Bhomington, Indiana, and a commonlations will be at a nearby hotel. The fee of \$150 inchules; letture notes, chatter buts transportation from fudianapolis of the interest of the strain of

at a nearby hotel. The fee of \$150 includes; letture unies, chaiter bus transportation from findianapolis to filmonington on November 3 and return to the Indianapolis airport on November 5, all meals except breaklasts, and lodging.

Anendance will be unith findied to 48 participants. Please make your plans move to aftern this outstanding short course. Details regarding application procedures will be atomitted in the July issue of the Dictision Newsletter and the Augost issue of News and Information. In the interim please address all inquiries to Roy Kligfield.

Meetinas

Announcements

Exploration Geophysics

'Complex Ceology: A Ceophysical Challenge' is the theme for the 36th Annual Meeting of the Midwest Society of Exploration Coophysicists to be held in Denver March 6-9, 1983. The meeting's organizers expect 60 technical papers in categories that encompass case histories; thata prosessing; magnetotellurics, gravity, and magnetics; modeling; seismic inversions; three-tlimensionat geophysics; and vertical seismic profil-

ing.
Full sessions will address vertical seismic profiling and the three-dimensional seismic techniques. Several nonseismic papers in be discussed include nonconventional techniques such as radiometrics.

For more information, curtact the Deuver Geophysical Society, P.O. Box 5226TA, Denver, CO 80217 (telephone: 303-425-5584).

Planetary Sciences

The 15th Annual Meeting of the Division for Planetary Sciences (DPS) of the American Astronomical Society (AAS) will be held October 17-20, 1983, in Ithaca, N. Y. Contributed reports from all areas of planetary science are

Tides for contributed papers must be submitted no tater than August 1, 1983; abstracts in the usual AAS format are due August 15. Send titles and abstracts to the program chairman, Steven J. Ostro, Space Sciences Building, Cornell University, Ithaca, NY 14853. Questions regarding travel an commodations should be directed to the local arrangements chairman, Joseph A. Burns, at the same address.

The Department of Astronomy and the Center for Radiophysics and Space Research at Cornell will host the DPS meeting.

Ozone Symposium

The international Ozone Commission of the International Association of Meteorolog and Atmospheric Physics (IAMAP) will hold its next Quadrennial Ozone Symposium In Halkidiki, Creece, September 3-7, 1984. The program Includes discussions on re-

cent developments in observational (cchniques; analysis of both surface-based and satellite ozone observations; chemical-radiative-dynamical model calculations; observations of relevant trace constituents and their budgets; laboratory measurements of chemicat rate constants and absorption cross-sections; interaction of ozone and circutation; radiation topics relevant to atmospheric ozone; ozone climate interaction; non-urban tropo-spheric ozone; and future directions. Invited nd contributed papera will be delivered in

both oral and poster sessions. For more information, contact by June 1.

1983, Christos S. Zerolos, Charringo, Local Organizing Committee, Physics Department, Campus Box 149, University of Thessaloniki, Thessaloniki, Greece. Send a copy of your request to C. D. Walshaw, Secretary, Interna-tional Ozone Chinmission, Clarendon Labora-tory, University of Oxford, Parks Road, Ox-

ford, OXI 3PU, U.K. The deadline for abstracts, which must be in English or French, is February 1, 1984. Contributors will be notified of the accep-

tance of their papers in April 1984.

The symposium is cosponsored by the Commission of the European Communities, the Academy of Athens, and the World Meteorological Organization.

Reflection Seismology

The International Symposium on Deep Structure of the Continental Crust: Results from Reflection Seismology will be held June 26-28, 1984, at Cornell University in Itlaca, N.Y. Among the topics to be covered are the results of seismic reflection profiling of the deep continental crust in countries throughout the world; structure of orogenic belts; nature of the Moho; mechanisms of condnental accretion; and state-of-the-art techniques in deep seismic reflection profiling. The Cornell geological sciences department is sponsoring conference.

For additional information on the conference, the submission of abstracts, or registration information, contact Muawia Barazangi, Conference Coordinator, Department of Geological Sciences, Cornell University, Ithaca, NY 14853 (telephone: 607-256-6411; Telex: 93747a).

Cretaceous Climates

The Geological Society of America (CSA), with the International Geologic Correlation Program, will sponsor a Penrose Conference led 'Cretaceous Climates' October 2-7, 1983, in the Colorado Rockies.

Many hypotheses have been presented to describe or explain warm, equable, 'lce-free' geologic periods. The Cretaceons pariod is of particular interest because it is the largest contrast from the present-day 'glacial' regime that can be well documented. As such, Cretaceous paleoclimatic studies have implications for a wide variety of problems in the geologic sciences and for climate in general. In order to develop better interpretadous, test hypotheses, and formulate climate model experi-ments, it is necessary to develop multidisciplinary associations to take full advantage of the Gretaceous geologic record and modern concepts of oceanic and atmospheric process-

one major objective of the conference is to bring together scientists from a diverse group of geologic disciplines actively working on problems directly related to Cretaceous pa-leoclimates. The geologic record of Creta-

ceous climatology, including paleoborative certebrate paleoutology, micropaleoutology, scalinearology, and isotopic geochemistry. will be a major focus. This focus will include a global coverage of the geologic record litcorporating thata from continents, epicontinental sear and shelf regions, and the surface and fleep oceans.

Cretateons paleogeography and plate reconstruction will be a second focus. The conference also will take advantage of recent rlimic model experiments than are based on the physical laws that govern the atmospheric and oceanic circulation.

A one-day field trip to the Pueblo, Colo., area will be held in the middle of the couference to examine a complete Cretaceous sea level cycle and flie associated biologic and climaric record.

Applications should be sent to Eric 8 arron, National Center for Almospheric Research. P.O. Box 3000, Boulder, CO 80307, by June 1, 1985. Those desiring to natend the conference should include a brief description of the topics they wish to contribute or the reason for attending the conference. Other conference convenors include William Hay (museum, Unviersity of Colorado, Boulder) and Erle Kauffman (department of geology, University of Colorado, Soulder).

Geophysical Fluid **Dynamics**

An international meeting entided "Turbulence and Predictabilly In Ceophysical Fluid Dynamics and Climate Dynamics' will be held June 14-24, 1983, in Vorenna, Italy. It is ofcially designated as a course by the Italian Physics Society, which is the major sponsor.

The course addresses itself to advanced graduate students and junior postdoctoral scientists studying or active in the atmospheric and oceanographic sciences and related disciplines. Topics will luclude experimental, numerical, observational, and theoretical results about fully developed turbulence, its onset, and its predictability. Quasi-geostrophic, planetary, mesoscale, and microscale turbulence in the atmosphere and in the ocenn will. be emphasized. The dynamics of climate and predictability on various time scales will be discussed in the same context.

Prospective participants should write to R. Benzi, scientific secretary of the course, Centro Scientifico IBM. Via del Ciorgione 129, 00147 Roma, Italy. A vita and two letters of recommendation should accompany applica-tions from junior candidates. Some limited travel support will be available for junior participants with no other source of travel funds. A small number of senior observers also can he accommodated. These potential participants should also write to Benzi and, if they wish, may include a vita and list of publica-tions. Applications should be mailed by March 15. The total number of participants is limited to 70.

FIFTH CONFERENCE ON THE PHYSICS OF THE JOVIAN AND SATURNIAN **MAGNETOSPHERES**

Cambridge, Massachusetts June 21-24, 1983

caalona: on aalatita affacia on the magneto sphare, inlaraction of the magnetosphere with rings, dual, and actellite surfaces, radio and plasme wave amiasion in relation to par-licia and fiald structura, anergetic perticles, magnalospharic configuration, dys analys budget. Invited and Contributed Papers

Abetract Daadline: Merch 15, 1983 Further Information: Junifer/Saturn Conference e'o Prof. H. S. Bridga, 37-241, Massachusetts instituta of Technology, Cambridge, MA, 02139, (617) 253-7501.

In addition to the Italian Physics Society, the course is sponsored by the Italian Ministry of Public Instruction, the Consiglio Nazionale delle Richerche (CNR), the U.S. National Science Foundation, the National Aeronantics and Space Administration, and the American Meteorological Society.

Lake and Reservoir Management

The North American Lake Management Society will sponsor an international lake and reservoir management symposium October 18-20, 1983, in Knoxville, Tenn.

Symposium objectives include presenting sine-of-the-art lake and reservoir management techniques; exchanging information among researchers, managers and usera; identifying research and management needs and goals; and identifying the role of specific lake and reservoir management policies in the overall use of the resource. Among the sessions planned are water quality assessment methods; watershed management; morteling techniques and innovations; addle precipital tion effects on surface watera; agricultural runoss and water quality; urban runoss and water quality; and political realities of lake

Abstract submission deadline is March 31, 1985. Length should be limited to two double-spaced pages. Papers from principal investigators and students are welcomed. Those prepared by August 31, 1983, and presented at the meeting will be published in a proceedings. Abstracts abould be sent to Lowell Klessig, College of Natural Resources, University sin, Steven's Point, WI 54481 (telephone: 715-346-3783). Interested persons not presenting a paper but wish additional information about the symposium sliguid contact

Wayne Poppe, Tennessee Valley Authority, 248-101 Building, Chattanooga, TN 37401 (telephone: 615-751-7333).

May 30-June 3

The 1983 Spring Meeting of the American Geophysical Union will be held in Baltimore from Monday, May 30, to Friday, June 3, at the Baltimore Convention Center. The con-vention center is linked by an elevated perlestrian walkway to Harlzor Place, a tlevelopment of cobrild and unique boutiques and restaurants overlooking Haltimore harbor. Hotel Accommodations. Blocks of ronus are being held at the Hilton, the Hyatt Re-

gency, the Holiday Inn, the Howard House, and the Harbor City Inn for those attending. liead the housing application and mall the completed application form to the housing bureau early to ensure reservations at your

Registration. Everyone who attends the meeting unust register. Preregistration (re-ceived by May 11) saves you time and money. and the fee will be refunded if AGU receives written notice of inability to attend by May 26. Registration rates are as follows:

	Pre- registration	One Day
Member	\$115	\$32.50
Student Idember	\$112	\$16
Noumember	\$H5	\$12.50
Student 1990greinber	\$39	\$19,50
Retired senior incrober	\$32	\$ 11i

Ahoy! Sail Back into Baltimore

1983 AGU

SPRING MEETING

May 30-June 3

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(301) 727-3400

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(301) 685-3500

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Single, \$58.00 Double: \$68.00

Twin: \$68.00

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\$15.00

Single: \$\$1.00

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\$10.00

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10 \$250.00

Single: \$39.00

Double: \$47.00

Twin: \$55.00

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Single: \$33.00

Twin: \$42.00

Extra person:

Single: \$32.00

Twin: \$37,00

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Double: \$37.00

\$10.00

Double: \$38.00

Perlot + 1 \$52.00

\$10.00

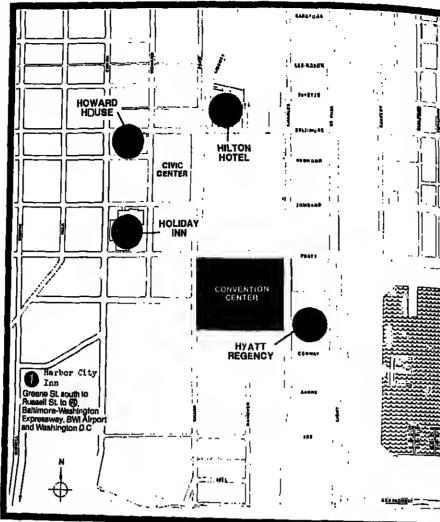
Registration for I day only is available at one half of the above prelegistration rates, either in advance or at the meeting. Members of the American Meteorology Society, the American Society of Photogrammetry, Union Geofisica Mexicana, and the American Congress on Surveying and Mapping may regis-ter for the inreting at the AGU member

The difference between niember (or sindent member) registration and nonmember registration may be applied to AGU dues if a completed membership application is re-ceived at AGU by July 25, 1983. Current ACU annual membership rates are \$20 for members and \$7 for student members.

To preregister, fill out the registration form, and return it with your payment to the AGU office before May 11. Your receipt will or included with your preregistration material at the meeting. Preregistrants should pick up their registration material at the preregisation desk at the Convention Center, Monday through Friday hours are 8 A.M. to 4 P.M. On Sunday, May 29, registration hours are 5:30-7:30 P.M. in the lobby of the Hilton Hotel. Complimentary badges for guests not attending the scientific sessions will be available at the registration desk.

Transportation. For the visitur arriving Baltimore-Washington International Airport (8 VI), it is only an 8-mile ride to downtown Baltimore. Be sure to read the special annonncement about discounted airlare, which also applies to flights to and from Washing-

Scientific Sessions. The preliminary program with abstracts will be published in Eos. May 3. All scientific sessions will be held at the convention center.



American Geophysical Union (5) **SPRING 1983 MEETING**

> May 30-June 4, 1983 Baltimore, Maryland

Honsing Coordinator

AGU Spring Meeting

El ant Pratt Stroot

Ballimana Hyasing Bureau

Halbriore, Maryland 20202

HOUSING APPLICATION FORM

READ CAREFULLY:

Please print or type (plea speced) all information abbreviating as necessary. Confirmation will be sent by the hotel to the individual named in Pert I. If more than one room is required, this form may be photocopied.

PART I

Parti

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NOTE: Rooms are assigned in "First Come First Serve" order and i) none of your choices ere evelleble, another lecility will be sesigned besed on a referral system erranged by your convention organizer. A cut-off dete is in ellect and your epplication may not be processed it received eiter 14 days prior to your errival data

*AGU housing registration deadline is April 25.

PART III

INSTRUCTIONS: 1. Select type room desired with errivel and deperture detes. 2. PRINT or TYPE names of ALL persons occupying room. 3. If more than two psople e

two double	bede.	ilale a room,	cneck twin	and the h	otel wi	ii assign	ĺ
CHECK ONE							
☐ SINGLE(Room with one bed one person) ☐ DOUBLE(Room with one bed Iwo persons) ☐ TWIN (Room with two beds Iwo persons) ☐ P # 1 (Parior plus one-bedroom suite)	Departure Dale	MO DAY	Gusst Nemes (Pri	ni Lesi Name	Firsi)		
D P+2 Parior plue two-badroom sulle O EXTRA PERSON	Arrival Time	AM PM	3.			in the last of	

IMPORTANT NOTE: Hotel MAY require a deposit of some other form of guaranteed arrival. If so instructions will be on your confirmation form,

Social Events. An Ice Breaker on Monday evening at the convention center is the opening social event of the meeting.

Complimentary refreshments will be served daily in Exhibit Hall A. Coffee breaks are from 9:30-10:30 A.M. and beer breaks from 2:45-3:45 P.M.

Awards Ceremony and Reception. The Awards Ceremony will be held in the Francis 5con Key Ballroom of the Hilton Hotel at 6:00 P.M. on Wednesday, June 1. All meeting participants are invited and are urged to atlend. A Reception will follow the ceremony: you can meet and congratulate those being

honored and share a glass of wine with them

President's Dinner. The President's Dinner in honor of the medalists, awardees, and fellows will begin at 8:00 P.M. at the Hilton. It will be a more lavish and formal affair; black tie is optional. Tickets for the dinner are \$25 per person. Purchase yunr tickets with your preregistration.

Exhibits. The exhibit area in Exhibit Hall

A, will open 9 A.M. Tuesday and will remain open through Thursday between 9 A.M. and

Exhibitors roufirmed to date are:

Academic Press Inc. American Geophysical Union Defense Mapping Agency/HTC. Elsevier Science Publishing Company, Inc. Nature's Own Kinemetries, Inc. Phoenix Geophysics Ltd. 5apphire Instruments Schonstedt Instrument Co. Teledyne Georech Terra Technology

Business Meetings and Section Luncheons. The AGU Conneil will meet Tuesday, May 31, at 5:30 P.M. The annual business meeting of the union will follow the Council meeting. Members are welcome.

The Solar-Planetary Relationships Section business meeting will be on Thursday following an afternoon technical session. Refreshnients will be serred.

Section hinchengs will be held in the Hyan Regency. Rooms will be published in the atmeeting program. Please indicate on the registration form which huncheon you plan to attend and include parment. Cast is \$9,50 per ticker (except for the Seismology Innelicon)

The Oceanography Inncheon will be held on Tuesday, Bruce Robeson, University of California at Santa Barbara will speak on the "Status of the UNOLS Research Fleet."

The luncheous of the Geomagnetism and Paleomagnerism, Hydrology, and Planerology/Vulcanology, Geochemistry, and Petrology sections will be held on Wednesday

The Seismology luncheon, sponsored by Kinemetrics, Inc., Teledyne Inclusives, Inc., and W. F. Sprenguether Instrument Co., lne., will also be on Wednesday; rost is \$5,00

The Annospheric Sciences, Georlest, and Tectonophysics luncheons will be on Thurs**RETURN THIS FORM WITH PAYMENT TO:**

Meetings Registration American Geophysical Union 2000 Florida Ava., N.W. Washington, D.C. 20009

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Geophysical Year

New Listings

The complete Geophysical Year last appeared in the December 21, 1982, Eas. A boldface meeting tide indicates sponsor ship or cosponsorship by AGU.

March 6-9, 1983 36th Annual Meeting, Midwest Society of Exploration Ceophysicists.
Denver, Colo. (Denver Geophysical Society, P.O. Box 5226TA, Denver, CO 80217; telephone: 303-425-5584).

June 14-24, 1983 Turbulence and Preliciability in Geophysical Fluid Dynamies, Varenna, Italy. Sponsors, Italian Physics Society, Italian Ministry of Public Instruction. Consiglio Nazionale delle Richerche, U.S. National Science Foundation, National Aeronau-Meteorological Society. (R. Benzl, Scientific Secretary, Centro Scientifico 18M, Via del Giorgione 129, 00147 Rome, Italy.)

July 18-20, 1983 Applied Probability In Biology and Engineering, Lexington, Ky. Sponsor, ORSA/TIMS. U. Gani, Organizing Chairman, Department of Statistics, Universily of Kentucky, 857 Patterson Office Tower, Lexington, KY 40506.)

September 7-10, 1983 AIPG Annual Meeting, Jackson Hole, Wyo. 5ponsor, American Institute of Professional Geologists. (Gene R. George, General Chairman, P.O. Box 2775, Casper, WY 82601; telephone: 307/265-9199.)

September 18-21, 1983 Eastern Section Annual Meeting, Mohonk Mountain House, New York, 5ponsor, 5eismological 3oelery of America. (Ellyn Schlesinger-Miller or Noel Barstow, Lamont-Doherty Geological Observatory, Palisades, NY 10964; telephone: 914/ 359-2900.)

September 19-21, 1983 AGU Midweet Regional Meeting, Milwaukee, Wis. Conve-nor, Robert W. Taylor, Department of Geoingical Science, University of Wisconsin, Mil-waukee, Wisconsin 69201. (AGU, Midwest Meeting, 2000 Florida Avenue, N. W., Wash-Ington, DC 20009).

October 2-7, 1983 Penrose Conference on Cretaceous Climates, Colorado Springs, Colo. 5ponsors, Geological Society of Ameriea and the International Geologic Correlation Program. (Erle Barron, National Center for Atmospheric Research, P.O. Box 3000, Boul-der, CO 80807).

October 3-7, 1983 Chapman Conference on Reconnection in Earth's Magnetosphere, Los Alamos National Laboratory, Los Alamos, N.M. (Meetings, AGU, 2000 Florida Avenue, N. W., Washington, DC 20009).

October 13-14, 1983 The Water Re-

sources of Ceorgia and Adjacent Areas, Allanıa, Ga. Sponsors, Georgia Geologie Survey. Georgia Institute of Technology. (Bernd Kalın, Environmental Resources Center, Georgia Institute of Technology, Atlania, GA 30332; telephone: 404/894-3776; or Ram Arora, Georgia Geologic Survey, 19 M. L. King, Jr., Drive, S.W., Atlanta, GA 30334; hone: 404/656-32 | 4.)

October 18-20, 1983 International Lake Knoxville, Tenn. Sponsor, North American Lake Management Society. (To send abstracts, Lowell Klessig, College of Natural Re-sources, University of Wisconsin, 5teven's Point, WI 54481; telephone: 715-346-3783. For additional information, Wayne Poppe, Tennessee Valley Authority, 248 401 Build-Ing, Chattanuoga, TN 87401; telephone: 615-751-7833).

June 25-27, 1984 Rock Mechanics to Protection and Productivity, 25th U.S. Symposium on Rock Mechanics, Evanston, Ill. Sponsor, AGU. (Cluries H. Dowding, Department of Civil Englacoring, Narthwestern University, Evnnsjon, IL 60201; telephone:

312/492-7270.) Juoe 26-28, 1984 International Symposlum on Deep Structure of the Continental Grust: Results from Reflection Scismology Itliaca, N.Y. (Muawla Borazangi, Conference Coordinator, Denartment of Geological Scienees, Cornell University, Ithaca, NY 14853 (telephone: 607-256-641); Telex: 987478).

October 17-19, 1984 AIPG Annual Meeting, Orlando, Fla. Sponsor, American Institute of Professional Gedlogists. (Bobby J. Timmous, General Chairman, Timmo sociates, P.O. Box 50606, Jacksonville, FL 32250; telephono: 904/246-4533.)

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Advances in **Core Drilling** Technology

Some notable technical advances in shill design were reported at the meeting, held in Canada August 30-September 1, 1982, at the University of Calgary. Chief amongst these was a battery powered, computer assisted electronicchanical core deill which has recently been used by the Danes in Greenland to continuously core to the base of the ice sheet at 2038 m. This is the deepest coring operation to far on the Greenland ice sheet. (The recoul for theep gliceer drilling is held by the U.S. Army Cold Regions Research and Engi-neering Laboratory for the continuous coring through 2164 m of ice to bedruck at Byrd Station, Antarctica, in 1968). In early 1982, a current Soviet core drilling operation was re-ported to be at a rlepth of 2000 m at Vostok station, Antarctica, where the total ice thickness is about 4000 m; the goal of core drilling the entire ice thickness there could be

achieved before the end of 1983. A number of different versions of the now femiliar Rufli-Rand electronicchamical core drill for retrieving up to several hundred meiers of dry, uncontaminated core at cold sites were described by Canadian, French, Geiman, Japanese, and U.S. drillers. Several smaller mechanical coring devices have been specially designed for use at high mountain

sites or on the Arctic sea ice. Thermal tirilis (both hydrothermal auti electrothermal types) are the other major class of ice drdle. The more important electrothermal drills have been very successful in competing with the submersible electronicchanical drills for deep core drilling operations. The electrothermal drills are currently championed by the Soviet and French drill engineers. Of great importance is the correct choice of a drilling fluid, especially for the deep holes and locations, such as east Autaretica, where the surface temperature can be as low as -57°C.

ciers increasingly relies on the rechnology of ice drilling for its success. The existing large Ice drilling on the major ice sheets is now array of different ice drill units, some bard an international entleavor. Comperation off the drawing boards, some still in active among nations is needed primarily to reduce service, and others trapped in their ky each nation's financial commitment. Deep ice graves, attest both to the ingenity of their coring operations are now regularly penetrat-ing well into and even beyond ice deposited inventors and to the lensight of the scientists who promoted their reacepts. during the last glacial (80,000-10,000) years A proceedings of 26 papers is planned by B.P.). Availability of this core, some of it still the U.S. Army Cold Regions Research and in storage, has opened up a vast paleo-atmospheric research domain, involving isotope Engineering Laboratory as a Special Report

This meeting report was prepared by G. Holds-

geochemistry, conventional ion geochemistry (to parts per billion concentrations), counting of particulate matter, and measurement of **Top Sponsors**

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SUDIES UTILIZING IN SITU CRYOGENIC, UNDOE AIR SAMPLING METHODS
Charles C. Gallagher (Air Force Geophysics Laburatory, Ranacon APG, Massechasetts 01731), Charles A. Fornabarg, Robert V. Pter!

The fluoreceation and nitrous exide content of the strateghers have been studied as a function of attitude, intitude and time. Whole air samples have been gathered from a balloon platform, primarily through cuse of a cryogenic ampler. Tuenty-tue flights were conducted between 1975 and 1980, and gos chronatography was stifland to determine species siving ratios to the ratifored samples. Results are evaluated in tarms of various atretosphere models.

1. Geophys. Ros., Green, Paper 10127 J. Geophys. Ros., Green, Paper 301427

0440 Convection, dllfuston, mlking, turbulence, and

J. Guophys. Res., Greau, Paper 201496

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O.GC tplanerary waves;

TRO-LATTUDE CIDAR GESERVATIONS OF PLANTTARY NAMES IN

THE HIDDRE ATHOSPIERE DURING THE MINTER OF 1981-196.

S. Reuchecorne (Service d'Aéronomie du C.N.P.S., 6.P.)

3]NO - Verristan-1-Sulsaun, Francai, M.L. Chemin

A quest-continuous survay of the atratospheric and

mreospheric temperatura was performed, between June 1931

ted April 1962, using the lider station of the Observa
tory of Raute-Fruvance (At²N, 6*P). During the period of

denterly winds in the lower stratosphera, i.e. from

June to September, the veriability of the temperature is

observed to be very low. As long as prevailing winds are

wisterlies, from October to Harch, remporature profite
are continuously perturbed by planerary waves, with a

maximum of emplitude in January 1981, before the "strong

there was a server of the winds of the case in the presence of a voll-defined lo-day

wave laterproted as a free Rosety wave, and the existence

of large parturbotions with pariods of 25 to 40 days

which are contactively axplained as a succession of wince

upper stratospheric wormings due to the litterfurence of

the 18-deg cravaling Roseby wave and a stellowery wave.

Iplanetery waves, Roseby wave and a stellowery wave.

J. Geophya. Res., Green, Paper 201955

J. Gaophys. Res., Green, Paper 201985

0450 Tides, vevse end winde MERIDIGNAL MEUTRAL WINDE IN THE THERMOSPHERE AT ARECISO: SINGITANEOUS INCOMERENT SCATTER AND AIRCLON-MESSERVITANE

ARECTSO: SUNITAREOUS ENCOMERENT SCATTER AND AREGION OBSERVATIONE

E. G. Burnalde [Space Physics Research Leboretory, University of Michigen, Ana Arbor, Michigen 69107], g. S. Sabuke and J. C. G. Valler

Significance measurements of lon and mentral wind valuelities have been obtained at Aracibo, Puerte Sico, on several mights in both the memor and winter seasons. The diffusion veiceity of O*, calculated in an amiyata uning the accepted walue for the schipplar diffusion confictions and the MSTE model attemphere, fa found to be fa fairly close agreemen with the observations. Tracherent scatter reder date have also been used to derive height profiles of the calculations feueral who walue for line and the maridiocal feueral wind valueity. In general the meridiocal feueral wind valueity are first scatter, polor to middlight for the spring and tummer contain, tentours of constant velocity are offen observed to slope downwed with lucrossing time.

Foce deeve of constant velocity are offen observed to slope downwed with lucrossing time. observed to alope downweed with increasing time. Some degree of vertical wind shear to often observed between 0100 and 0500 AST as well. It has winter mouths, maridional wind velocities are lower, and the mostureal vertication of the wind field is less pronounced than at other seasons. (Neutral winds, thermosphuse, subthers alfolders.) thermosphuce, aubipoler diffusion). J. Geophys. Pes., blue, Paper 3A0105

Oldo

Diddo

Did Geophys. Ros. Latt., Paper 310095

the ram direction was observed on a long (400 second) exposure. From analysis of the resulting speciful data it appears that the shalling flow home a diffuse spectral observed to the region \$500 to \$60000. In addition, it has been possible to measure the spectral observed or light satisfied by the firing of a resulting control system threaders of any other possible to make the spectral observed and in the state of the

Neophys. Res. Latt., Paper 3L0099 Electromagnetics

O770 Radio Oceanography
Analysis of Colifert Motioe Efficis in Marsen t-Band
AR MAGERY
D.R. tyzenga and R.A. Shuchman (Pador and Opiles
Division, Environmental Research Institute of
Michigan, Ann Arbor, Michigan, 481071
Synthelic Aperlure Padar (2AR) 2-band images
collected over the North Sea During the 1979 MARSIN
experiment show numerous apparent point scatterers
imaged with a degraded resolution in the along-track
direction. The observed resolution of these features
is consistent with a scatteror cohorance time on the
order of 10°-sec or a vertical acceleration on tha
order of 5 m/sec. Observations of the resolution
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Bringl, V.P. Persolan and A. Lahimeru
Altumination of electromagnetic waves by a
random distribution of pair-correlated district
sphores is studied as a function of frequency and
solume concentration of sphores. The main oin of
till puper is to compare theoretical results obtained using a self-consistent multiple scettering
formulation and measured values of outenaction for lormulation and measured retues of disensation i lotus apheres in water. The ogreement between theory and esperiment is very good. Rad. 8c1., Paper 380069

Exploration Geophysics

PRIO Computer applications
18VESES SCATESERS FOR A LATESES ACCOSTIC MEDIOM DEING
TES FIRST-GROSS EQUATIONS OF HOTION
M.S. Ecward (Suploration Desearch Civision, Conera
lac., P.O. Ecg 1267, Ponca City, OK 74681) lac., P.O. Ear 1267, Ponce City, OR 74681)
The inverse scattering problem for a layered acoustic madium is considered from the first-order differential equations of morion, resulting in a rector form of the Schrodinger lawerse acattering methods. The result is a water farm of the Schrodinger lawerse acattering methods. The result is a water farchenko equation. The solution for plane waves at normal inclidence is given along with a good approximate solution which is cealing obtainable and takes into account transmission losses not included in the normal WKSI-Sorm approximation. A new solution for sxtracting separately the velocity and density of the medium using the reflection response for two different angles of incidence is given, which involves a nonlinear integral equation to relate the apparent transitions or description.

OSIG Computer Applications
THE INPLUSECE OF OUT-OF-PLANE ROSPAGE PROPERTIES OF
UPHIGRATER TIME SECTIONS
JACK S. Cohen Department of Mathematica, University of
Denver, Co 002081 Morean Siciately
Soth analytic and numerical means are used to
demonstrate emplitude and phero behavior of reflections
from three-dimensionally quived laterfaces. In
particular, the high-frequency geometrical optics
approximation for the behaver acettered wave field
demonstrates that the phase of a reflection from a
typical mastion for the behaver acettered wave field
demonstrates that the phase of a reflection from a
typical las determined by the lie general, differently
posisions of focal regions for the two primipal curves
at the epacular reflection point. Thus the amplitudes
and phase of sweats observed on estimate acetions are
influsemed as much by the shape of the reflector
"out-of-plane" as by the shape of the reflector
"out-of-plane" as by the shape in the plane of the
tactics. Results of the numerical examples suggest
possible pitfalls is traditional laterpretation of twodimensional science data.

GEOPENSICS, VOL. 48, NO. 2

MOURTET DATA
Riaus-Peter SengoLei (Sundessnetalt ful
Georissenschaften und Schatoffe, P.O. Soc. 51 015)

Olyg General Jearoncomy)
OBSERVATIONS OF OFFICIAL EXISSIONS ON SIS-4
S.L. Mande (Lockheed Pale Alte Recearch Laboratory, Pale Alte, Ca 945M), O.K. Garrioll and P.K. Essim following the discovery of interest to the state of the species of the species of the species of the processing of the secondary field date obtained with a single-frequency alrhorde the species to prote this phenomenon was developed and onners was equipped with an objective (remainsion) oraling and several photographic exposures were takes of the sphytic lail from the eff fright dack window. Vehicle xlos sucromeding shuttle surfdees exposed to species to prote the eff fright dack window.

The values of P₂ and d₂ are good approximations of the true resistivity and true depth of an extended, buried conductor only where the shirlding effect of the cover is small. Moreover, a dapth value has a quanting only within the interal limits and to select acceptable depth and resistivity values by means of the "erea of d₂ confidence," which is derived from the horizontal gradient of log p₂ and the maxima of d₃.

The results of the resistivity/dapth mapping sethed are presented in the form of two contour maps. Examples of the practical application of the method, over known sulfide ore bodies and over a sait water intrusion, show that reliable data can be obtained on the depth, dap, and extent of these kinds of conductors, as well as on the approximate resistivity of the conductors and the host roch. the host roch. CEO/HTSICS, VOL. 48, NO. 2

OSIO Magnetic and electrical methods
MICROMAYS ISOPERTIES OF SATURATED RESERVOIRS

James 5. Lange (Department of Pigsics, Oklahona State

University, Otiliwater, OS 740781

Dieletric properties of saturated, porous geologic
materials reflect the large difference in dielectric
constant of typical asturating fluids such as water

1c 774 or oil and ass [c = 1-3). The deconvolution of
locality dielectric properties of saturated percus
material into the composent perts requires a detailed
model of the composent perts requires a detailed
model of the composent perts requires a detailed
model of the composent perts requires
model in the microwave frequency regime is the
primary purpose of this inwestigation. A model is
availated in which the dielectric constant of the
composite is equal to the sum of the dielectric
constants of the composents weighed by the volume
fraction occupied by sach. That model is compared to
measurements at microwave frequencies made on agreeme
consisting of glass heads, quarts, or send saturated
with chlorobanness, 1,2-dichforotthens, methonol, or
air, and Ind satisfactory agreement. When water is the
saturant and interaction between water and the solid
matrix has an important effect on the composite
dielectric constant. This interaction is observed to be
particularly farge for quarts and water and suppresses
the composite dielectric constant quice considerably.
This interaction is dependent upon the relative surface
area per unit volume, de composite dielectric constant. This interaction is observed to be
particularly farge for quarts and water and suppresses
the composite dielectric constant effect on the composite
dielectric constant suppressed of the composite
dielectric constant may be possible for cissa
reservoirs. The inverse process of determining surface
area from in-alicu measuraments of the composite
dielectric constant may be possible for cissa
reservoirs and known lithology. In sendanome from carea
the dielectric constant is afso below the volume
fraction model and corrections ar

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ABARTSIS OF AEROMACYFIC MIASUREMENTS FROM THE CASCADE
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Atmospheric and Oceanic Physics Volume 18, Number 1

Gurvich A. S., Kan V., Popov L. I., Ryumin V. V., Savchenko S. A., Sokoloveky S. V.

The Temparature Profile Restoring from the Sun end Maon Filming from
the Orbital Station «Selyut-6»

Gevrilov N. M., Shved G. M. An investigation of Internal Gravity Waves in the
Lower Tharmosphere Based on Isophotes of the Nightglow

Gryanik V. M. Redistive Releaseiton of Temparature Perturbations in a Finita in-

bomogenoous Atmosphere Koprov B. M. On Estimetes of Atmosphoric and Oceanic Meridional Energy Transfer Karyukin G. A. A Wind Influencies on the Operation of the Radioacoustle Soun-

ding Systems

Dvoryeshing Ya. V., Dianov-Klokov V. I., Fokeyevo Ye. V., Yurganov L. N. Mathnde of Daterminations of the Total Atmospheric Column Abundance of Molhane Anktiov A. N., Koulzeogy K. P., Kiekin A. B. Simulation of Acrosol Propagation in Plonts by the Monte-Carlo Method

Nelepo B. A., Protsenko I. G., Timcheokn I. E., Yarin V. D. Remote Meesurements of the Level Surface in the Studies of Synoptic Variability of the Ocean

Lozovatsky I. D. A Model of the Vertical Structure of Turbulent Leyers to the Ocean

Ocean Voronovich A. G., Goneharov V. V. Tho Effect of Large-Scalad Motions on the Pro-

Goncharov V. P., Molvayev A. K. Observations of Non-Linear Waves on the Inversion io the Atmosphere.

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Volume 16, Number 3

Rudnik G. B., Mclankholina E. N., Kudryaviaev D. I., Lomova O. S., Salonov V. G., Shimidi O. A. Malerial composition of the oceanic crual in fault Emperor and Murray lault zones (the Pacific Ocean)

Kogan L. I., Zonenshain L. P., Shinidi O. A. The lectonic structure of the Hess Rise

in life Pacille Ocean (according to data of deep seismic profiling by method of reflected waves)
Ishulin V. V. The Red Sea rift an its sole his distribution of Fe-Mn mineralization reflected waves)

Ishulin V. V. The Red Sea rift an its tole in distribution of Fe-Mn mineralization Golzhevsky A. A. Faults on the Ukusinian shield leading Zolojarev A. O. On indications of the newest vertical movements of the confidential plotus selative to alterations of the World Ocean level Zverev A. T. Interreintion of recent, newest and old vertical lectonic movement of the East-European platform.

Bocharov O. V., Gusav G. S., Esikova L. V., Spektor V. B. The map of recent vertical movements of the Yokutak ASSY territory.

Miskaimov E. M. On melloda of the formalional analysis of the platform deposits (on the example of the West Siberian plate).

Mskalmov E. M. On mellioda of the formalional analysis of the platform deposits (on the example of the West Siberian plate)

Dobrzelinoisksya L. F., Ez V. V. Melamorphic rocks in melange of the ophiolitic bella of the Lesser Csucasua (urochishche Adzhails)

Ourbonov A. M., Mamedov A. I., Yusifov I. S., Omarov A. M., Dzhsvadov Ya. D. On lectonics of the Shekhdag synchinal zone of the Greater Caucosus.

Koinev O. S. Anomalica and structures of the Azov-Slack Ses region.

Antipov M. P. Teclonics of the sedimentary cover of the Japan Ses parts adjacent to the Honshu Island.

OTRO Relamic methods

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K.K. Tureking thepr. of thenlosy & Googhyales, Yats Takversity, Bon Abha, New Haven, 17 05511), E.K. Sendage and E.E. Hion

Yhe fould deposite by Tuxon of aloph and The year deim ained at East Haven, Connection and Bornada cut approximately the amos nemual period in 1977-1975. Dr. 1984 it has now membrahad virtuality romains at May Error 1973 to 1978, the Ying in the 1977-1978 period heing 1.2 depayer /y. The 21876 Yang at Soranda in 0.69 depayer /y. This lower flux than experts from model colouisticans is due to the actabilahment at a blocking high pressure celf during the semant spice definets continued out. The 'Be fluxes at the first and doing as are 22.7 and 17.1 depayer /y, volus considerate with actabilahment at a factor with actabilahment at the first and the first and the section Borth Atlantic occasions is selled. J. Geophyн. Eqs., Green, Paper 201674

Hydrology

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3173 Soil Moleture
UNSATURATED FLOW IN SPATIALLY VARIABLE FIELDS II.
AFFLICATION OF WATER FLOW HODELS TO VARIOUS FIRMS
Schal Realer Colvision of Soil Physics, Institute it solls and Mater, ARO, The Volcool Center, Bet Deportion of Soils and Mater, ARO, The Volcool Center, Bet Deportions and Gedeca Bugan

A method oil modeling actar Flow variable and of affective hydraulic properties. Two spatialty carries and redistribuifes has been applied to compute display tions and variances of aciar flow variable and of affective hydraulic properties. Two spatialty carries investigated. The approximate acquision are included investigated. The approximate acquision with the computed by some site with the first variable and of form and options acquised to a vorting from and options with accompation of insum results with data computed by accompation of insum results with data computed by accompation of insum results with data computed by accompation of insumination of the flow of the flow variables when the fluid is deficiently of the flow variables when the fluid is deficiently variable fluids, so the properties of the flow variables when the fluid is deficiently variable fluids, so the properties of the flow variables when the fluid is deficiently variable fluids, so the properties with a single properties and properties

LEGATURATED FLOW IS SEATIALLY VARIABLE PIRIDE. PART 1:
DESTVATION OF ROBBLE OF INFLITEATION AND REDILERISOTION

9. Degan ischool of Engineering, Tel aviv University
and Division of Boil Physics, ARO, Velcani Concer,
lersel) and E. Bresler

Rodels of vater flow in the upper sell layer of
apacielly variable flow in the upper sell layer of
apacielly variable flow in the place in the horizontal
ylens. The estuceraß hydrosell conductivity is assumed
to be a random veriable of lognormal distribution, and
bend suction and moleture content are related to it by
simple analytical asietlessips. The six of the study
is to derive the expectation and veriaocas of the
moleture gostont, suction had, bydraults conductivity
and water flux as functions of depth and time for
infiftration od redistribution. Toward this elm a
minipilised colution of vertical flow in a honogeneous
column based on the concept of noving froot, la

JiSO Metat quality HASATURATED FLOW IS EPATIALLY VARIABLE FIELDS III. SOLUTE TRANSPORT HOUSES AND THEIR APPLICATION TO THO FIELDS

Solis and waste moste and least affiliation to two FIRIDS

Eabal Steader (Division of Soll Physics, Institute of Soils and Water, ASO, The Volcool Center, Bet Degao, Israel) and Gedoon Degan

An approximate model of salt trensport in a specially variable field during infisitration and radistribution is presented. The woler flow is anauged to be vertical sood both wester pore-valuatry and dopth of watting front phange in the bealmootal piant due to the variability of anti hydraelie properties. The self fransport in the vertical profile is computed by using an approximate, closed form solution, of the senwertloodisparines equation, with the value of the disparaivity Secressing from sact to the anxiety is an as the front Secressing from eato to the England 13 cm] on the front propagates downward. The concentration profiles vary in the horizontal plane because of the variation of water flow variables. The expertation value and the erience of the concenfration are computed se function if Capth and ties for two soils, one of large variebility, and the second, of leasur variebility. The results are responsed aith these based so a numerical abulantee of the water flow sed nell transport, as route and respires attaches seed on a numerical absiliation of the vater flow and nail transport, as well as with those pertaining to so squtesient, deterministic, onlifers not! [for the experted value]. It is shown that the approximate model yields quits around for that field of fires which billy, whereas some of the field of fires which billy, whereas some differences are present for the more uniform one. The assults for the superied value, based on the readitional approach of replaning the variable field by an equivalent uniform one, include a much largest arror. The onle conclusion is that in spite of the apparent complexity, the athietical moments of selt toncentration in a spetially various [sizlo can be determined by uting simple lies models. (Transport modeling, hydroulic properties, disporativity, statistical womants, randonness).

3199 General | Applications of Surface Soil Holsture Information) BETHATING PROFILE WATER STORAGE FROM SURPACE ZONE BOIL HOVSTURE HEASUREMENTS UNDER MARE FIELD CONDI-

LONS.
L. H. Arys Liothhand Engineering and Menagement Services Corpany, Hall Code C-N, f810 MASA Road One, Enusien, Texas 77258), J. C. Richier and J. P. Paris. Studies to remote sensing of sail moisture indiasis that the dapth of the sail for which moisture
asis that the dapth of the sail for which moisture
allocation is obtained for very nhallow. Thereyars, in order to rehance the utility of the
remotely cansed sail moisture are needed which will relate
the prefile moisture conditions to those of the
outlete some. A linear regression approach was
used to extinste profile water storage from the
storage in the outlace zone. For a given thickness
of the surface zone, the retrelations between the
surface-zone and profile water storage decreased
as the public Capth Increased; for a given profile
dapth, these correlations increased as the surface
ands thickness increased. In general, the exteintions were higher for irrigated corn fields then
for hare finion. Peaults show their the profile
dapth for which water asonage can be predired
from surface some noil moisture data depends on
the thickness of the surface zone, the cultural
condition of the field, sod the toeffirient of
outlantion concludered adoquate. As alternative
procedure to estimate water atorage in a Geap
profile under here lield conditions is based on
the assumption that change in profile water storage over a parisod of tice equals not auxyace flux
over the name time. Surface fluxes are computed
from surface-some soil woisture Geat and hydrologic
properties of the soil. The regression approach
is used to entiente none-surface moisture gradioutnigives only se synrage surface-zone moisture
velop. In a simulation study, not averyace fluxe
very nearly equaled changes in water alorage al a
2.25--deep profile. Fur a field-measured data
act computed surface fluxes bound on aurface-some
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igalistics aboved good overnif agreement. [Surfarsons budget).

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Meteorology 1710 Soundary layer neructures and prosesses A MODEL BY THE ATHOPPHENIC SOUNDARY LAYER OVER THE

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A MODEL OF THE ATTOPHERIC COUNDARY LAYER OVER THE MAKADINAL ME ZOME

J.E. Overiond [Pacifir Merins Environmenial Laboratory]

SCAA, Seattle, WA SS105) and C.E. Peace

A con-layer, prinifive equation model is presented for the atmospheria boundary layer over the uarginal ice codes [MIX] which simulates find elso rate of inversion growth and rate of varying of the boundary layer over the uarginal ice codes [MIX] which simulates find elso rate of inversion of su Ice edge for off-ice wieds observed on two truleses of su Ice edge for off-ice wieds observed on two truleses on the Boring Lead wide observed on two truleses on the Boring Lead of the HIXAA RIV Supergrey. The haricantal respectatory of Columbia University, Psiisades, N.Y. 10964)

Observations of infrasound apparently generated by the obligated by the obligate and high frequency of the electrostation for the control of the superitude section of the observations seem to confirm some of the bootte along with electric field measure—that and high frequency of the infrasound pulses is shout 1 Na and the amplitude section of the observations of sisoctrostatic sound that of the observations of sisoctrostatic sound, thunder].

The observations of infrasound peaces, N.Y. 10964)

Observations of infrasound apparently generated by the obligated by t Also he specified over the interior of the ice sod drag crefficeints for smooth ice, a Jo-km-wide, rough margin- al ire sone, and an unachie surface layer over the aceso are used, she model shows a derrease in wied epeud of 10% of the windward side of the XIZ and a 18% increase in aide speed and a 17% increase in wind street in the transition from rough fee to open water beginning i be intorior to the ice adge with a marinum in speed at 40 in measured of the adge. These roults suggest so almosphesia pockenies for refing at the aindward elde of the marginal ice sone, divergence of the last at the side of the last of the sone divergence of the last at the side of the last of the sone divergence of the last the side of the last of the last of the side of the last of the last of the side of the last of

3715 Chtoltal Composition
1VIPENCI. FOR QUASI-PERIODIC COMPONENTS IN DOSSON
NERROBE TOTAL OZONE RECORDS
Paul D. Guthric [NASA/Coddard Space Flight Conlor.
Code Sed. Greenbalt, Maryland, 20771]
FONOT systetrus analysis has been applied to the total
acone time sories at sech of a sample al Dobson stotions
with records of more than 15 years in the interval 1057
ta 1981. The distributions of strongly periodic or
quasi-periodic signeds show distinct features at periods
of 3.5-4.0 years, 27 months, 21 months, and (1.5 months,
Soveral stations show two or nore such lesiures in be
sans time serios. Possible gnophysical implications
are discussed. Jozone. Quasi-Biennial Oscillation;
J. deephys. Mas., Green, Paper 200901 J. deophys. Fas., Green, Paper 300P01

3715 Chemital Composition and Chemical Interactions Aquigus Oxidation of So. By hyphogen pergator S. M. kunen (Fred C. Hori Associales, inc., Denver, Coloredo 80225), A. (. Lazrus, G. L. Yol, and B. C. Hibes (National Center for Atmospheric Research*, National Center for Atmospheric Research*)

J. Goophya. Res., Green, Paper fc1861

3720 Climainlogy
THE GENORIC RETORN OF CLOUTIC CHANGE
T. J. Growloy (Physics Department, University of
Missouri-St. Louis, St. Louis, Missouri, 53121)
This paper reviews the principal results from
calcoolimate studies, and includes background
makerial slanted loward climate modelsers. The
interest temporature history during the last 4.6
billion years initeates major changes in the composedies of the Earth's climate system. A secular
clamage in global insolation receipt is due to a
20-303 increase in solar luminosity since the
lowartion of the earth. A 72-HyD greenhouse eflect may have offset the lower luminosity during
canchy carch initiony. Informed Fluctuations of
global temperature have equired over a proad
range of time scales. On time scales of 109-109
years paleogeographic factors (e.g., continental
infit and healest clamage) have contributed
significantly to temperature changes associated
with transitions between nonlactal and global
afates. Preliminary modeling efforts indirect
that skidicional factors to 3. 20-2, changes in
accompanies circulations must also be constinued
in order to explain the origin of morefacial and
mates.

The origin of polar to caps may result from

in order to asplain the origin of non-garla's instant.

The origin of polar ice caps may result from ocean circulation changes that were equal by plate tecturin processes. Physicalizes of the volume on a time scale of 10-10 yours correlate with insolation variations cause by orbital permissions. Received interactions within the lami-scalar-less system (a.g., ocean circulation changes and indicate system (a.g., ocean circulation changes and indicate system (a.g., ocean circulation changes and indicate system (a.g., ocean circulation changes and believe typenism) have been responsible for a significant swhitten of the orbital signal. Less against pedia to orbitally-indicate temperature designs superimposed on a global croling of townstrial origin. (Pales-Clumting), review.

37ff Clastrical Phenomena WHEN REPORT: CORMA-POINT TRANSPERSING IN A THUMOLA CLOUD AT LANGUE LABORATORY ONITY REPORT: CORMINATION TRANSPERSING IN A IMPROVED CLOUD AT LANGUAGE LABORATORY

5. S. Weber [Neval Research Laboratory, Code 5160, Mashington, e.C. f\(^{1}\)314, M. P. Biswarr, and A. A. Few 4 metoorologiral radioance, and filed by the sitarhuset of vertirally oriented, pointed, moist rods and sancitated instrumentation, was released hemself a thundercloud as Lengmuir Laboratory, New Menico. In addition to information on isoperature and winds, the instrument provided an estimate of the vertical responsest of the cloud electric field by measuroment of corous rurrent leduced to the rode. Charge solumes interest from the seconding were [1] asgative charge at b.b km RSL [temparature -12° C) where northwesterly winds apparently indverted the charge investigative charges the charge investigative charges at the first mass in sease precipitation enthers. [2] positive charge at the first mass in sease precipitation enthers the vind' flowed corthward into the rioud's navii; [3] a 200 a tible acreaning layer of negative rherge at the cloud's upper surface; and [4] a small, roncentrated region of charge cast the cloud heso. These rherged ragions were orident in solvess of low pracipitation intensity Ling Z \(\) 1.31, which were well away from the storm's conventive center. [Thunderstorme, cloud electricity, roreas, aloctrir fields, Lightoing.]

electricity, rorous, electrir fields, Lightoing.]

3735 Electrical pheachers
ACOUSTIC AND ELECTRIC RIGHALS FROM LIGHTWIND
N.K. Eslachandran [Lemont-Doherty Geological
Observatory of Columbia University,
Psiisadee, N.Y. 10964)
Observations of infreeound apparently
Commarcial by the colleges of the Siectro-

J. Geophys. des., Cress, Paper 100074

350 at a specified over the interier of the ice sed drag craffireints for smooth ice, a 10-im-vide, rough marginal ire soon, and an unstable surface layer over the acase are used, she model shows a derrance in whe depend of 30% at the windward olds of the NIZ and a 18% interests in what are stated in from rough fee to oppe were beginning 3 he interior to the ice stage with a marisum in speed at 40 he massard of the stage. These route suggests on almosphelf a medbudge for refling at the sindered side of ate marginel is some, divergence of the last at the side and formation sexuard of che edge.

J. Gaophys. Ras., Green, Paper 300076

J. Gaophys. Ras., Green, Paper 300076

J. Grophys. Green, Green, Green, Green, G

3755 (ntermelion of almosphere with electromagneric PARAMETERIZATION OF CARBON GLOX (DE (5 µm BANG ASSERPT (O)

PARAMETERIZATION OF CARBON GLOXIDE (5 µm BANG ABSORPTION AND PHISSION 5.C.S. Gu and X.M. (fou [Moleonology Department]. University of Utah, Soil (ake City, Utah Balit?)

A parameterization scheme for carbon dioxide [5 µm band absorption and emission is developed based on the time-by-time (remaintinate dum protented by Fels and Schwarzbopf (1981). He derive two polymonial equations in represent the brondband emissivity ms (untitons of the temperature and prossure torrected path length. A delatied error smityls has been performed and the root mean square errors are shown to be on the order of 5% and 7.5% for the lower and upper atmosphere these, respectively. Cooling rates unloutated from the emissivity parameterization approach show errors Within about 5% when they are tempered with those compated from exat line-br-time integrations. ((arbon diotide, radiotion parameterization, carbon dioxide in absorption).

J. Goodbys, Res., Crean, Paper 470006

Coloreda 80225). A. (. Lazrus, G. L. Fal, and B. C. Hithes (National Center for Atmospherit Ressich*, Soulder, Coloreda 80307

The squosus oxidation of 5(1V) by He(), is one of the principal paths of acid forwardion in the atmosphere Severni Investigators have reasured the rmic tonsicant for the restlein: Hig(a) + 5(1V)(a) - Hig(a) -

J. Geophys. Res., dreen, Paper 300101

3770 ACCORDIS (VOICENTE IDECOME) ENGROUSS INCREASE OF STRAIGSPHEMIC AEROSOLE OVER FUCUORA DUE TO VOICAMEC ERUPTION OF SL CHICHOM LE 1982 Fukuoka, St2, Japan) and T. Shibais Fokuoka, St., Japun) and T. Shibate
Large intreasus of attetocapheait aerosol particles
caused by the arupaion of Marican volcano El Chichon
(a early April 1982 were observed by a Teg lider system
at two wavelangths 41.08 ym and 0.53 ym)ower Pukuoba
lot three months since April 18. Host of the observ-

lor three months since April 18. Hose of the observations show high concentrations of seresois in the sittinds regions from 15 to 13 km, with highest concentrations between 2f and 10 km. The seresoi optical thickness as 0.55 bm is about 0.1 - 0.3; this is about 10 to 30 times the maximum monthly used values that were observed after the Mt. St. Niers owent in 1980. The mean raffus of seresois in the densest part of the Si Chickon afoud is saturated to be approximately 9.1 um. This settimate is bessed on the slow sattling valueity of the peak of the eloud end from information obtained by comportson of the two-wavelength lider returns.

returns.

A significant impact of the presence of the cloud on be climate through variotions of etmospheric sircular-on is suggested. {Lider, stretosphero, voicanic

1770 Particles and Aerosols

1770 Particles and Aerosols

UNITUAL BEHAVIOR IN TSG CONDENSATION NUCLEI CONCENTRALION AT 30 Kms. J.H. Rosen (Papt. of Physics
and Aetronomy, Unfversity of Wyoning, Letanfe WY

Sfofil and D. J. Hofmann.

The results obtained with an improved balloon
berns accidensation quickt [an] counter that is
capable of operating to eltitudes of ar lesst 10
km shich could be deacribed by a sudden roncentration intrease of unusually small particles
occurring in the vinter or spring fellowid by a
ona to three manch decay period to background
lavels. The magnitude of the warletion has intreesed Grammically including the revent generally higher fevols of voicemic activity eflecting the lower strainsphere. Several percecial explensions for the event are considered,
but none appear amitrely satisfactory or conplate at the present time. The explansion with
the fewart drawbacks would ettribute the production and prowth of the now on to a highly
superacturued H₂SO₄ vapor layer presented by
any one of several proposed processes to the
upper Alp. Intitude stratusphere.

J. Geophys. Rec., Green, Paper 300114 1. Geophym. Ros., Green, Paper 300114

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Ivanov K. O., Fel'deidein Yo. I. To the discovery of boundary layers to the inforplanolary magnotoploama

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Bolegiarov M. I. Iofluence of sudden lonospheric disturbances on propagation of radiosignals of VLF range in high latitudes (880)

Kleimenova N. G., Osepyan A. P. VLP-radiation during the SC (681)

Andreevs L. A., Anoshkitt V. A., Klinio M. M., Kiyuev O. F., Kocholov O. A., Monch K. L., Merzhanov A. G., Patrov G. G., Uibin V. B., Chorvyakov V. V., Shipilov V. V., Steinberg A. S. Experimental examination of a naw method of generation of a plasma cloud in the lonosphere (883)

Polapov B. P., Sobolav V. G., Sukhodeav V. A., Ysrov V. N. A now method of dafining of the height of emission layers (885)

Yurchooko O. T. Registration of emission OH (10,4) 6086 A in the emission of night atmosphere (687)

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for describing of magnalospharic plasma

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THE RESERVE OF THE PROPERTY OF

1/70 Patriclas and Agrosols
THE 1980 BRUPTIONS OF MODEL SI, RELEWS: PHYSICAL AND CHEMICAL PROCESSES IN THE SHATOSPHEPIC CHUDS 6. P. futco (R f D Associocas, Mailus del Rey, Ga 90291), a. S. Tood, B. C. Uhitten, P. Honill, E. G. Yesel

AND CHEMICAL PROCESSES IN THE SHATOSPHERIC CLOUDS 6. P. Futco far P Assocrotors, Mailan del Bay, GA 90291), a. S. Toon, S. C. Whitten, P. Homill, S. G. Yesseen

The physical and rhtmicel properties of the sitatospheric slouds produced by the tecent oruptions of the Norm St. Helons volcano ate investigated. The intege and divorse set of observational data to libered is the high-sititude pieces of the May 13, May 25 and June 13, 1930 eruptions is organiced and smalled for oridence of the processes et work. The data are used to guide and constrain destributed model choistione of the volcanic clouds. For this putposs, a comprehensive une-dimensional model of singuspheric saliate actsois, sullus preturent geess, and volcanic act and dust is utilized. The model attracts are greatly in the slouds, second mutisational termsite are given for the time histories of the gnessum exprises concerns singular distributions, and ash burdens of the ergation thode. The long-term builded of stratospheric necessary in the Stratospheric cone are sto investigated. For is concluded that for, water vapor, and sub-probably rear the cost important subsequently large organic facts of the secundary large and the probably rear the cost important subsequently by surface concerns in the Mouthern technique of the citate of the stratospheric cone are sto investigated. For is concluded that for, water vapor, and sub-probably rear the cost important subsequently breaked and the stratospheric to the wide-speed affacts on composition, and the impact on citate. Despite the secundary large organical the St. St. Releas cuption, il is found that the volcano had little inliuence on the citate of continue the solution of the secundary of the stratospheric and chanistry, and regularonate for future asportental motiv, are discussed.

J. Scophys. Rem., Green, Papet 100084

3780 Storms
tightfully Propagation and Verset Density in Equal times
A3 Defermine Propagation and Verset Density in Equal times
A3 Defermine Magnar i Competitive Institute for Massessia
Matsurologicol Studies, University of Chishman, Berman,
Obishman, 1019), and M. Osvid Bust (Ferional Bavero
Corner Liboratory, Morman, Obishman 19069).
The propagation of lighteing has been studied using
studer ischesiques. The tire time of radar scheens is explained by ionized channel propagation through the rador beam. The traiculated values agree well with those
obtained experimentally. Measuroments of the radial
velocity of streamer propagation Islang the antenns
beam abow specyds of st least 2.3 s 10 fe/s. The timecamps varietions in lightning actions see Indicative of
Ill new ionization as attenues develop into different
parts of the aloud, [2] thennol decay during whith adsquits ionization as attenues develop into different
parts of the aloud, [2] thennol decay during whith adsquits ionization as attenues develop into different
parts of the aloud, [2] thennol decay during whith adsquits ionization as attenues and the selfining recrame. Lightning afters in the United
distance of the content of the content of the constates and shows that the manitum lightning density
lends to be near the issuing offer in the Philiad
States study shows that the manitum lightning density
lends to be near the issuing offer in the practification
cone is developing relis. At a tell in the squal
line develops and the total lightning density interespendominand.

The traphes kindship of course, and the long lishes
decinite like lightning activity. (Storms, electrics)

. Ceogham, Rem., Creen, Pager 201dat

1790 batturenit and Techniques
AT AFPOSOL AND GAS SAFFLING APPARATUS FOR REMOTE OBSERVATION OF SERVATORY SERVATORY (MORA AIR Resources Laboratories, Boulder, Colorado 80303).
An air sarpling apparatus is denerified that mindration at appling height in 10 m or more above ground level for a field statton, and that mindres loss of particular and descruction and that mindres loss of particular and descruction and contamination of sarpled frace strasferic gates as aff in conducted through the department of the servator for apparatus winds for it executing under midely varying chirace conditions, and all the form systems have been beilt, and they have been asid successfully since 1971 at the NOAA Geophysical Country for Climatic Change [DK1] program bate that Monalioring for Climatic Change [DK1] program bate at Maniloring for Climatic Change [DK1] program bate Maniloring for Maniloring for Ch

gaces). J. Geoptyn. Few., Green, Paper 20199)

J. Geoptys. Few., Green, Paper 20199)

3703 General (Meteorology)
COMPRISON OF LONGANE RADIATION CALIFIATION
METHOD DARK THE UNIFED STATES
J. L. SETURIS (Inc.) All and Mater Patourcer.
University of California, Givis, California,
150(6), P. J. Raginala, and S. B. Idro
Long-ava radiation models currently in use have
rean expirically derited and ray anly be oppliable
to shall scoprophic cross. Data ware rollected
a 15 iccations in the Usulad Shatas to provide
a dats set from which the Dunc, Swinbart, Idio
and Jarrece, Scutsaart and Idsa languave soders
sould be evalunted. Only alone sky data wire
used in the overcuctor of the endate and the date
ware tontrivinad to the nightfrier hours to avoid
any soler wadistion bilat on the redicator. The
Swinbart and idso and Jarfoon which provide the
foorest life arrose locations. The Bruni codels
with its original proefficients, the Bruissert
and 1/30 rodels were the most consistent over
locations and could be util bead with lest than
Stepror. [Long-ave radiation, sfy exittance,
stopicial is passe models).
Water Percur. Sees., Paper 201852

Oceanography

A763 Set level

CJASTAL SEA LIVEL RESPONTE TO YRONTAL SASYALES ON

THE LOOISIANA-TELAS OSSES

Wen-San Chang (Coastal Stadies lostitute, louisiase
State Vivereity, Senton Squar, Louisians 19803) and

Wen-San Chang (Coastal Stadies lostitute, louisiase
State Vivereity, Senton Squar, Louisians 19803) and

Wen-San Chang (Coastal Stadies Incended on SSea level varietion tesulting from wind forcing
along the Louisiana-Tesan shelf are massined on Sstate violet are dominated by coffed-front Insages.

The violet are dominated by coffed-front Insages.

The violet are dominated by coffed-front Insages.

The nesocialed surface wind listed is well organized,
as level response, houses, shose considerable varias level response, houses, shose considerable variability; it is satisfy a response to alongshore who

This spatially ropoutiform temporas appears to be due

which to theilower off Square island and Evers direct

to as:h region, and the results compare well with

Shearusiloun. (Subtides variability)

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J. Goophys. Res., Orden, Paper 100040

J. Crophys. Les., Crewn, Paper 201662

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J. Ears 1800 [Lean Structure for Archic Meeco | AFE Creculation | St. Ears 1800 [Lean St. Ears 1800 [

A705 Saundary Later and Exchange Processes
SEVISED PARAMETERS FOR MODELING THE IMAMSPORT OF FCB
COMPONENTS ACROSS AN FIR MAILER INTERFACE
Siched f. Sopp Flamost-Boberry Geological Observatory
of Coburble Chiversity, Pollandse, New Yorth 109641
A number of revisions of the date base and
acceptualizations utilized in sit-water transport
models for PCS componence are suggested. The most
significant of these involves the semigrament of
physical chemical properties on the basis of degree
of thiorination. The affect of temperature on the tate
of transport is also discussed. The revised model to
tenied on a sumber of natural situations and compared
to swafishe date. PCS components, air-water
tosegort, chamical petemetera).
J. Geophys. Bos., Green, Paper 2018P4

A705 Noundary layer and archangs processos
THE 3995/TIVITY OF UPPEA OFFAN STRUCTURE TO TIME
VAREING VIND OLERSTION
T.O. Olckey [Depertment of Unningical Scientes,
University of Southern California, Les Angoles, CA
90789-0410, J.J. Sispeon
Observatione and sodels show that sudden theogas in
the magnitude of the wind stress which occur within a
time folerval of ose-half insettial pariod are toot eflartive in increasing surface cutsett speeds sed airing
the upper layers of the cash. The purpose of the present study is to quantify the affects of condutrent
time dependent wind direction. The Hellor-Tampes level
2 i/1 instudence closure sodel is used. A linearly
attentified anter column located at 10°6 is absent for
call trust. A spriss of model twen were recuted in ordet
to dolated so the relative sansitivity of mixed layer
depth and sea surface impactators of wind speeds coupered with the rate of chenge of sind direction. The
results indicate that the scouracy sed time resolution
of wind direction should he alway spatial consideration
in the design sed locatpeatation of first experiments
which will be used for teating prognetic sized layer
sodels. The results support the conclusion of the Satsilits Surface Stress (2°) Working Group that methods
of suppleanning annatorometa data stress traquited for a
proper implementation of upper ocear andels which inquire wind direction presibility as so input.
Geophys. Pos. Lect., Paper 2L1910

AllI Citualstion
ODSEWATEMES OF MEAR-SERVACE CISSENTS AND TEMPERATURE
IN THE CHITRAL AND MESTERN TROPICAL ATLANTIC OCEAN
N. L. Molinaci (Mational Genoic and Amosphecic Administration). Atlantic Oceanog rephic and Mateorological
Laboratorian, 4501 Rickenbacker Causoway, Missi,
Florids 11401
Slaven entail tra-tracked drifting buoys rere deployed
in the central Sameh Atlantir Ocean duting two seweral
supmer and jos susteal uinter creises. Satween #8 and
11% and 21% and 11% during susteal winter, met bony
drift was to the rest. Sorleas geostrophir lise was to
the rest between f0 and 9%. It is proposed that
atrong seutheast trade winder are induced siractly-driven
surfact Flows to the rest, which are some intense then
the samtward seastrophir lises sessilated with the
Banth Equalorial Countercurrent ISECC). A sustained
during susteal cummer, when the trades are somewr. The
irajetrorius indicate surface retate north of 8% have
a seen northward responsent. The buoys which delifted
north beenes entrained into the North Bressillan Obsetel
Gurrent ISECC) and those which drifted south, late the
Grall Current. One buny left the MECC at about 5% to the
Grall Current angest that the MECC rey actean only to
15° — 40°4 during boreal enter. Temparature data
obtained as the buoys drifted sessioned and conthwatd
auggest that increases in upper leyst heat content can
be altitluted to heat Ilwas through the new surface.
J. Coophys. Res., Grean, Paper 10031 J. Coophys. Ros., Green, Paper 100081

J720 Distribution and water meases
MATER MASS ANALYSIS IN THE CERRAN BEGIT EURIN;
MARSEM, PHASE I
G. A. Sacker iDauteshee Hydrographisches
thatitut, Bershard-Rocht-Str. 78,
2000 Habburg d, PRGI,
A. P. G. Pluza and I. O. Jamee
in the initial pheae of MARSEM Master meases and
Morth Frialsh Wedden Saa Water were found in
the German Sight in the late summer of 1070.
This is shown by t/8 diagrams of the CTO date
obtained with the RV "Friedrich Heinche" and
the RRS "John Murray". For each t/S paic the
percentage coopeition of the three main water
meases is catimated by applying the lisear
plaining theory. The distribution of the under
the German Bight.
A clearly separated water meae, which
originalse from the mixing of North Sas bottom
water and Eise metuary water, in found in the
frontal area. This fronts weigt in apparently
trepped by the vertical rutrent eheer and the
top.
J. Geophys. Pes., Orsea, Psper JCOObi

J. Georhys. Pes., Orseo, Paper JCOObl

4730 Internal Names
VERTICAL DISPERSION OF INSERTIAL WAVES IN THE UPPER
OCEAN PERFICAL DISPERSION OF IMPRIVAL NAMES IN THE UPPER OCEAN

O. M. Rafenatein [Ocean Physics Civision, Solence Applications, Inc., McLean, Virginia 22102]

A ilmer model of the vertical dispersion of near-inertial waves is developed. A porosity distribution meet the bottom of the computational domain minimizes bottom rollections, and simulates an ocean of infinite depth. The model to used to show that the vertical dispersion of near-inertial waves in the support ocean may, under cerisin conditions, contribute significantly to the observed rapid decay of inertial significantly be the observed rapid decay of inertial secilations in the surface layer. The hineting energy of inertial oscillations is sidilatively accepted with an e-folding time scale of 10 days or least, when the parameter almin/Nicpidial is less than or all order unity, where is at the toward-optimal his parameter almost of the surface layer thickness.

At the top at the pycnoclies the model predicts a velocity maximum, which develops as energy propagaces domard, out of the surface layer. Enswere, when the surper pycnocline is a sufficiently peaked a resonant frequency interference effect to predicted. This seffect model and this affect models and the lambetter of surface.

resonant frequency interference effect to predicted. This effect modulation the dissipation of surface siget inertial coolistions, and their magnitude after a store need not decay monotonically. We also make qualifative comparisons with deep-coan current shallow where 1005 a) observations taken in the saince coantyments. In the saince coantyments also a deservations, internal seves, upper coantyments. J. Goophys. Res., Organ, Paper 300040

Oceanology Volume 22, Number 5

Physics of the sea

Novikovo L. E., Ostrovsky L. A. On an acoustic mechanism of Isunami wave gene-Volosov V. M., Zhilanov M. A. Nonlinear Theory of large-scale flows over an onlsolropic bottom relief for a two-layer model of the ocean
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Komenkovich V. M., Larichev P. D., Kharkov B. F. Nomerical experiments with a
headropic guarkagoostrophic model of symmetric motions in the most acease barolrople quast-geostrophic number of synoptic motions in the upon ocean

Menain A. B., Moskulenko L. V. Calculation of wind-driven currents in the Mediterranean See by the electric simulation method (a homogeneous model)

Vorloy E. P., Pyzhevich M. L., Sukhov A. L. Flur structure characteristics of current velocities in the ocean

Toompuu A. G. Non-self-similarity of concentration variance in turbulent diffusion

733 In the sea

Vinogrodov A. S. The influence of the upper mixed layer out the radioactive influent
diffusion in the ocean

74

Marine chemistry

Maksimova M. P. The balance of blogenic chapens and organic matter to the Ballic Seo during intensive anthropogenic effects

Bobyleva N. V., Belyaevo A. N. Genesis and composition of lipids from the suspended matter and bollom sediments of the Baltic Sea

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Pelakhou S. A. On the anthropogenic component of the frace channel remposition

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Oksengorn F. S. On possible phosphorite presence on the Far-Eastern shell

804

Marine biology

Polyokova E. I. The sublittoral and lagoonal dialons of the Unickchie and Eost Siberian seas Tumoniseva N. I. Biomass and production characteristics of the protozoan plankton in the sub-Antarclie and Antarclie waters of the southwestern Pacific Ocean 813

Filat M. V., Timonin A. G. Trophic structure of mesoplankton in the southwestern Pacille
Tseillin V. B. Organic maller fransport during diurnal vertical inigrations of pe-

Observational methods and instruments

Ismailov T. K., Izmailov A. M., Gurevich P. M. A frequency-lime hydrodogical sound Lometko A. I., Sumtsov V. G. A digital system for hydroaconstic data tape recording

Rudenko M. V., Dzhamorio N. A., Berezhnuy B. D. The study of data on hollon

one rine suspended maller Domanov M. M., Voriman M. I. lounmelric delermination of polassing in sea water al a continuous c. m. l. contrul

ATOO SEA IDS SIDE MAYES AS A CAUSE OF ICE RIDE-UP OF THE SIGE WAYED AS A CAUDE OF THE RIGHT PORTHUMS
E. Hollo-Christenees (Uspartment of Preservings and Physical Occorrogrophy, Dasquinger's Emblique of Technology, Cambridge, W. Ocity)
Edge waves on lee covered unter, generated electrical actions along and current combine to give low stony velocity. The uspitude of vator relative forces to show can became large, and "so the sulling seceivation of the ice cover onto the shore may be sufficient to came the thempo on has been observed. Edge waves on leasurement of the ice cover with its approximation, and entirette are given of velocities and explicitude.

J. Geophys. Son., Oreas, faper Microl.

J. Geophys. Son., Orece, fapor 300030 4708 Surface wovee, Lider, and see layer ANALYBIS OF MARSEN X-BANO SAR OCEAN WAYE DATA R.A. Shuthman*, N. Rosonthel**, J.O. Lydan*, O.S. Lytenge*, E.S. Karfethka*, N. Ownshor**, and N.

iytenges. E.S. Kaelethkas, N. Ounhors, and N.
Itinnas

l'Environesalel Researth institute of Michigan, P.O.
Box ASIB, Ann Arbor, Mi 48107; **Max Planck thatitute
of Mabarology, inetitute of Geophysias, University
of Hamburg. Gaesany
Analysis of X-bond SAR iemoory coileched during the
MARSEN esparient indicates that the APB-10 SAR
system leaged both range and attenuth-traveling gravity
wave. Mosecer, only the near-edge portion of the
APD-10 Imagery provided reliable spectral sava estimates. Ammercuse motion artifert, ahith semifaci
themselves as asimuth-oriented streaks, are visible
on the data and are beilaved to Oc cound by bryoking
waves. Secuses of the large platfoca voicity, the
APD-10 SAR date are reletively inconsitive to asve
enhancement odjustements performed during the proceeing of SAR eignei hletories. A condustion
in situ measurement has been developed. The trensfer
function is isaliar and falls off more repidly with
wave namber for aclouch-traveling wave then for
range-traveling waves. This it a consequence of the
readiar inherent endvision for attenuin-invelling
waves and the degraded rotelution in the actauth
queitatively with theoretical predictions.

J. Occophys. Res., Orave, Papar 100078 J. Oecplys. Res., Otave, Paper 300078

a700 Surtace ways, tides, and man level
SEASA7 SYNTHETIC APERTURE RADAS OBSERVATIONS OF MAYECURRENT AND MAYE-TOPOSAPHIC INTERACTIONS
G.A. Masdons, R.A. Shuchman, 7.C. Isong, and E.S.
Kasiachte | Dept. of Almospherir and Occasic Scionce,
University of Hidolgon, And Arbor, MI, 48103| Environomniol Research Institute of Althigen, P.O. Box 8618,
And Arbor, MI 48107]
This study investigated the repedility of a spaceborne, imaging reder eyetax to detert subtle changes
in the propegation sharetexistics of ocean mave
eystems. Specifically, as evolving surface gravity
save ayales, assmanting from Hurricane Ells and propegating toward Cape Hatters, North Caroline, formed
eucceasfully imaged by the Sacesi Synthetic Aperters
fate Unile Alberta, Secretary of the second of the Colon of the Col

Particles and Fields-Interplanetary Space

5.160 Solar wind interactions with most and classic CHARGE-EXCHARGE IN THE Sharellassication of Verra 250 Mar. A 1931FARIRON IN THE Sharellassication of Verra 250 Mar. A 1931FARIRON IN THE Sharellassication of Plancias Physics, Butternity of California, to Sovere 250 Mar. California, Shuternity of California, to Sovere 250 Mar. California, Shuternity of California, Shuternity of the Starling segmentalization due to California of the Starling segmentalization due to California of Proposition of the Starling segmentalization in the Starling segmentalization due to California of Proposition of the Starling segmentalization of Starling segmentalization of the Starling segmentalization of Angeotopheath, atmospheret. Reophys. San. Lett., Paper M.GUIT

Acceptive. Son. 1-11., Paper M.0014

Sfol Bolar wind interactions with more and picasts of ABAL Chianatteristics of Harmatter FLUX ROPES IN THE WENGE DEVELOPMENT PROCESSING THE WENGE DEVELOPMENT PROCESSING THE RESEARCH ABROCKET ARROGATION OF THE TOTAL RESEARCH TO THE PROCESSING THE PROCESSI the ropes sary between 5 km st 100 km statuds and 15 to 500 km statuds, and soals roughly with both the toost lon gyroradius and ion inertial laught. Spoal toost lon gyroradius and ion inertial laught. Spoal toose 200 km statuds in the low sanith angle 1445 to the same appear to have quart-horizontal orientations, white those belon 200 km sitrude at the low smith white those belon 200 km sitrude at the low smith and randomly oriented helon 000 to. Ropes say that Minds and randomly oriented helon 000 to. Ropes say that Minds, and more on is the x445 regions than nearer teastsector. Rope flagf attempths are highest ask 100. high, and more on is the x48° regions than nearer to testactor. Sope first strengths are highest sain the attitudes whose their constraines may always its to, and scale with the equato root of the ambient rhermal pressure. Finity, the global pointlier of flux rope finit-milgnet corrents appear to be recommended to not clearly support a steedy, nontwipulant closely foreschedules. (Yemus, Yiux ropes, 1) J. Coophes, Nas. Sign Sanca 19001.

J. Ccophys. Ras., Sluc, Sapor 3A0911

or seeks air and layer couple some couple server couple server couples and uses to seek subject to consider the server couples and uses to seek subject to consider the server of the server of the server couples and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server wind drig constitutions, and the server couples are server with the server couples are server with the server couples are server couples, far: typical server seed in the server ser

heat Fluxes are presented end the possible role of the ion heat flux in suppling thermal energy during the radial expansion of the wind is exemined. Our findings neggest that wave-particle interactions and ter! Coulomb collisions for other yet unknown processes have to be invoked to order to explain the thermal searcy state of salar wind lone and their radial temporature profiles. How equation of states, delaberis travariants, ion heat flux). J. Geophys. Ros., Siue, Peper 241912

Particles and Fields-Ionosphere

t505 Farticles and Yialds - lonosphere (Airelou) THERMOSPHERIC GOO RITEGER 2. COMPASISON OF SOCKET GREENATIONS WITH A DIFFUSION TRANSPORT

THEREOSPHERIC OND AITHOUGH 2. COMPARISON OF RECKET DESERVATIONS WITH a DIFFUSIVY TRANSPORT CHERICAL MODEL.

R. P. NIGOY IS. O. Rulbuit Center for Epacs General, Raval Possetch Laboratory, Vashington, RC 20373)

A coordisonalogal madel of therecapheric odd mittoges chemistry is used to albulats at roltaneous rochet messurements at HO, NIAS; and Ollp) at Luillight. Good agramment between the observations sod the model is obtained for the NIAS; describes shows 100 km and for the NO densities shows 130 km. Olf-lerences between the K(As) profiles from the upleg mightglow and downing rullight airglow measurements are somistent with the district wateries of B/42; predicted by the theory. The model shows that with high thereospheric resperatures the distributed to the Resperature mensicipity of the rate for the production of NO from N/43; and O₂. The model is used to predict the solar cycle dependence of the NO chesilurisecous. [Airglow, Odd Nitrogen Chemical Model). J. Georghys. Ren., Size, Stope 24:554

J. Georgius. Ren., Slan, Stper 741854

5303 Particias and Pields - Ionesphere (Attgiou)
TREEPMORPHENTO GOO NYTROGER I. RO, NI 48) AND 01 3r1
ERROITERS FROM SOCKER MEASUREMENTS OF THE RO 6 AND
Y BANDS AND THE 02 BEELDERO I SANDS
R. P. ROCCY IE. O. Rulburt Center Iot Spare Recenth,
Ravel Research Laboratory, Writington, DC 10315)
Alrgious solscions from the spiper stroophers were
neasoured with frastrucents on a sounding rocket
launched on November 1, 1919. The nitric oxide
deite and games hands and the molecular oxygen
fittables of bunds were observed at evening wellight
with a pair of mitraviolet spectrometers and a
photometer. Kightglow selssion of RO and 02 wete
measured on the uples. Twilight RO games beed
floorsamoure and RO dolts band chemium searches
were measured on the downleg. The shitude
profiles of the RO and 01 mightglow maissions were
thwarted to yield the density of 013th between 90
and 110 tm and the dresity of N(45th between 100 and
200 km. The twilight RO games bend emission profile
was travered to yield the density of dittle oxide
between 11 sed 200 km. By viewing in the solar and
anti-solar directions on the two legs of the light
the ansautscants provide to indication of the texporel variation of the M'83 density. These observations provide the first shoultenous resourcements
of the themospheric densities of No, N(48) and
et 71. Altriguov, No 8 and 7 Sands, 0, 2 Retweers I
Sands, Odd #I trogge Density Measurements).
J. Geophys. Res., Sius, Papat 241851 J. Geophys. Res., Sius, Paper 2A1853

maseryalions of Samil-Scale Auroral Vaccines by the Sa-2 satellite Mad. Borks [Air Force Goodyptics Laboratory, Hanscom AFR, MA, 50131], e. Silavitch and D.A. Hetdy Me have studied two Intense auroral events which when encountered by the Sa-2 sociality and 5050 and - 1930 MLT, duting a subsitor, near the equalorment edge of the region i currant tysics. The events are married by large deflections to the east-mast adapted ic field component. In the disection corresponding to an upper-disconding to the sase the difficultion corresponding to an upper-discret sheet was sharpest, orrusing over 25 seconds. Upward current sheet was sharpest, orrusing over 25 seconds. Upward current attempths of 50 and 135 Major within istitude extents of 52 im are inferred. The principal region of return access is not continued to the principal region of return access is not continued to the principal region of return access is not continued to the principal region of return access is not continued to the principal current sheet, adjacent to the principal upward current sheets, adjacent to the principal puward current sheets, adjacent to the principal upward current sheets, adjacent to the principal upward current sheets, adjacent to the principal upward current sheet. The acceptance of the control of the principal upward to its original original related by 180° thus returned to its original original and accept in the virial auroral folds end curle. Respite spatial allacing, the reasonments of an election detector in the virially of the upward current theels provide esetul inforction concorning the density and temperature of the parent populations and the flaintilipand potential drop. All be soon reasonable accurations, it is shown that observed values of 1, and 4, are asmistant with abilistantess.

J. Gasphys. Ros., Blue, Paper 241022 RESERVATIONS OF SHALL-SCALE AURORAL WARTINES BY THE 53-2

J. Cauphys. Ros., Blue, Paper 2A1022

3.10 Electris Fields
A TEST OF THE COSIME-RELATIONSHIP USING THEER-RADAR
VELOCITY HEASUREMENTS
E. Hisland (Fag-Fields, FRC), J.D. Whitehead,
L.A. Heaberg and T.S. Jones
Three cobstet reason where been used to obtain
alouttamenus radial Deppier velocity assessments in
this directions from a second volume in the E-layer
of the high intitude lonesphere. The coslos-relationship,
vilet ware darfied in the Einid approximation of the
plasma locabilities assortated with radar aurore,
provides a somistocot framework is whigh to interprate
radial Deppier velegity observations. Kowaver, a
mystamatir disrepancy of the observed radial velocities
sed the coting-rainticochip is found and discussed, for
observations to the assistant atootrojer this discrepancy
is qualitatively on line with expectations hased on the
linetir theory of the testabilities, it appears that the
possible phane we observed to the pieces we ligited to
towar values than previously thought. This implies that
ausclaste of the electron drift velocity observed
seleg the fluid approximation at these may repleased on
undernatinate of the actual sleatron drift velocity,
(plasma instabilities, sleatric field).
Rad. Sci., Paper 18000

Rad. Sct., Paper 350030 3920 Flactore States

THE CHATANIKA RADAR AND THE IMS ALASKA MAGNETOMETER

CHAIN
7. Meside HRMA Speca Environment Laburatory, 325
Sroadway, Boulder, 20 20334
The reletive location of ignospheric parameters and
ground magnetic parturbations in the vicinity of the
Harnag discontinuity the examined. far this purpose, as
ase combined observe flows of the Chataniae incoherent
scatter reder and of the INS Alaska moridian chais of
segmentowhere, which wars continuously measuring the
crucial Indespheric parameters near the Harrang dis-

consisting of three speciet (elections, hydrogen tons, orygen loos) along a segment of survers magnetic Hisld line sxtending Iros so electrode of 800 ha to 10 set th teatil. We have postoreed simulations for the case of a current-line poher wind equilibrium at the Hield ise pheams and the case in which a large upward liaid-silgaed turrent is applied to the field line. In the foreor case, the agreement between our model and previous static tosuits is teasonable given the addition of the foreor case, the agreement between our model and previous static tosuits is teasonable given the cases. In the case of a field-signed turreor, we note that the link tube pleased responds to the current on several time scales. After an initial tapid heating oil the slectrons due to practipitation in a convexieng segment field, electric Hield coupling of the electrone to the lone causes thereal esclitations of the flux twbs pleases for preventing the couplicated nature of the response of a colisionism please when heat flow transport is treated in a dysemic sense. I wisher coupling of cases here coupling.

J. Coophyn. Ras., Blue, Paper 100001

5515 Interaction between waves and particles PERFERENTIAL PERFEIDICULAR ACCELERATION OF HEAVY IONOSPHERRIC TORS OF HETERACTIONS WITH ELECTROSTATIC LUBUMPRESIC 10% OF INTERACTIONS WITH ELECTROSTATIC HYDROGEN CVCLOTRON WAYES 6. Slogh (Concar for Atmosphetic and Space Silencts, Tab State University, Logen, Utab 84122), S.W. Schunh

The State University, Logan, Utab \$4122), E.W. Schunh and J.J. Sojes
The energiamiton of heavy loneaphetit lone by Electrostetic Rydrogen Cyclotron (EEC) waves is exacined, in particular, the oroblem oil pisfarentisi perpendicular according to the second of the second lose supporting the wave. Mith electric Hold wave amplitudes of a few tase of millivolt/m, it he shown that the interaction can give perpendicular energies of the order of keV for O'lose. No lone are shown to gain perpendicular energian sumilar than O'lose. It is indicated that upward flowing H'lone are shown to gain perpendicular energy. For a given electric Held wave amplitude Eq. the retain of snergization critically depends on the awarase parpendicular energy temperature) by got the background H'lon pleson. Examples are worked our lor values of Hyranging Irom it 200 eV. The resulting energizations and pitch ungles for o' and He'loss are compared with observations from season that are the compared with observations from account to the order of 2 seconds of an attitude of 5000 Co.

J. Geophys. Hea., Slue, Paper 140112

J. Geophys. Hee., dies, Paper 140112

5545 Innomphoric disturbances
MIGHTIME VPF AND CGS SCINTILIATIONS IN THE EAST-ASIAN
SECTOR OF THE EQUATORIAL ANGMAIT
A. V. Wornib (Omportment of Electrical Engineering,
University of 111 incin, Urbena-Champsign, Hilinais,
o1801; S. franks, C. H. Hu and D. J. Yang.
Geneutements made during solar navinum years to the
East Asian sector of the equatorial monally show different measonal percents of night-time actualitation
occurrence at 117 kHz at Lumping and 4 cHz at hong
Kong. These seasonal veriations are very sholiar to
that observed at the equatorial station in Camp, Indicating sirong coupling between equatorial and monally
fregularities. Model redputations indicate that the
GHz acintilistion observed at Hong from is such
stronger than one would expect based on VHF scintiliainight be an indication of sirong laritudinal dependence
of scintilistion in the emonaly region. We also distuan the possible difference in local tomospheric conditions that were responsible for generating 6Hz scinditions that were responsible for generating GHz scin-tiliation causing frequisities in the anomaly region and at the equator. (Ionospheric disturbance, radio Goophys. Res. Lett., Paper 310059

5560 Fertitle Frecipication THE SFFECTS OF EMERCHIC PARTICLE PRECIPITATION ON THE ATMOSPHERIC ELECTRIC CINCUIT in a numerical algerty CIRCUIT
1. d. Conges, S. C. Meyordt, J. S. Pvans, and W. I.
Linhol (Lockheed Psio Alto Cosearch Laboratory, Yalu
Alto, California, 04304), 6. 0. Joint [Office of

Alto, California, 04304), 6. 0. Joiner [Office of Mavel Research]
The scier particle event (SPE) of August 1072 is one of the largest that has occurred in the last 20 years and can serve as a good osample of a mejor parturbation to the simmepharis simptric system. In this paper ion production rates and ronductivities from the ground to 80 km at the past intensity of the event so 4 August and For 10, 13, and 40 km for the 6-day duration of the avent ser presented. At the peak of the event, the proton sed simptron presipitation currents, the chair current, and the vertical electric liads are relivated lesied the polar conp. The perturie presipitation currents at this tion. electric liaid are relivabled leside the polar onp. The pertiris persipiration cureact at this tion greatly second the cornel air earth ourset at siti-redes above 30 km and produce towarsals in the verti-nal electric field at 20 km and above. Calvulations one presected of the vertital electric field at siti-cudes east 30 km where beliege resourcements were made. Once agreement between the calculated and the momental vertical electric field vertices or ability mosecred vertical sisectif field rettless sor ability re taisuist disturbed accorderivities at these sittitudes from setallite seasurements of protos spectra incident on the stoophers. Despite the lact that at the peak of the sreal the earlied sleetrid field near 30 km was shorted out by the oular particles and neer 30 km was shorted out by the oular particles and that the ourrest exercied by the solar particles ar-ceeded the feir resther elf-serth surrent density is the stratosphere by large Fectors It is consided that the largest elfect of as EFE of this aegultode on the stonepherir electric citauit is due to the Fethesh dactones to the gelectic commic rey flux rather these to the large lowesse in solar proton flet. (Serticle presipitation, particle cutrents, etmospheria souductivity, some rey indication).

5363 Plasme motion, convoction or rirculation rtabilities).
HOWITE CARLO CALCULATIONS OF THE O' VELOCITY OTOTALBUTION
J. Geophys. 688., Sius, Paper 340113 HRRIT CARLO CALCILATIONS OF THE O' VELOCITY OTETALBUTION
10 THE AIRCRAL LORGOSPHERE
A. S. Barchat (Center for Atmospheric end Space Sciences,
Otth Stetc Vallership, Logan, Otah 843221, 6. W. Schude
and J.-P. St.-Mourte
The O' welocity distribution in the high-letitude yregion has been selculated sating a Monte Carlo techniquen. The sciculations were restricted to the cititudes
where O' -O collisions decises, i.e., between about
200-150 km. The Moote Carto calculations confirm the
serilar predictions, which were based on a simple releaserilar predictions, which were based on a simple releatic field was observed in the mideloff, for

A large [30 mW/m peak] impulsive weathard electric field was observed in the midelghf, low settled collision model, that the 0° valueity distributed these a toroider shape for large consection sisteric fields. However, the coroider factures appear only for electric fields greater than about 80-100 mW/m when a more rigorous leg-material titlesion model is used, thereas the relaxation collision model is used, the measurements were made alth the lower coincident with a shape 00 nf atap-like things in the x-tomponent of the magnetic field at magnetic field the convertion also between 200-350 km where the convertion slace.

CEUTROL HIGH ENERGY SPECTA AT 7 DIFFERENT DEPTHS IL THE ATMOSHIERE FROM 0 TO 40 MBAR MEAR THE GECHAOLETIC ENWYOR. V.L.BHATT (Physical Research Laboratory, Ahmedabad 330 009/India).

Ahmedabad 390 009/India).

Atmospherio neutrons A to 200 HeV ero aturied. Fouren differential energy spectra and integrated apoctra et 0, 4, 6, 10 and 40 mbar are given. Spectra for E > 50 KeV mre given far 7 different altitudas. All opertra show maxims seer 40 NoV and large drops mar 22 and 100 MeV ecufinal a closer structures. Our results at \(\lambda = 7.8^{\text{el}}\) ore compared with athers men \(\lambda = 42^{\text{el}}\) oth theoretical and experimental. Explanations are offered for the neutron amergy epoctra. (Atmospheric neutron energy apoctra.)

J. Goodyn, Sca., Blue, Proc. 24818

J. Googhya. Bes., Blue, Paper 2A1818

J. Gpochys. Res., Blue, Paper 24|B18

3599 General Ilonospharic Modification)

985ERVATIORS OF THE HT-EMMANCED PLASMA LINE WITH A 40.8

Mir RADAR AND REINTERPRETATION OP PARVIOUS GOOGREVATIONS

WITH THE 410 MR. RADAR

J.A. Fajer Mary-Flanch-institut för Aeronomia, J411

Katlanburg-Lindau 3, F.B.O., now at Arecibo Observatory,

Arecibo, Puerto Riro Obolil, H.B. Jerkic, R.F. Woodmen,

J. Eddeger, G. Sulzer, R.A. Behnce and A. Valdhuls

During 5.1 Mör HF Transmissions below the Tringion

pametration frequency by a namy's innompheric modilit
cucion laculity, radat onhose coming from F-region

heights at a fitaquency of 46.8 ± 5.1 = 51.9 Mix wore

racelved while a MIF radar using the 105 m spherical

reflector at Arecho was transmitting oulses colverently

on 46.8 MHs. The beadwidth of the echoos was loss tian

10 Hz. The so-tailed decay line due to the parametric

decay instability was supected at a frequency lower by

about 100 Hz but it was not observed. Density

variations caused by the pondernousive loter craulting

from the standing wave pattern at 5.1 Mix are

lectatively involved to explain the observations.

Foorly understood aspects of some pravious observations

(lunosphuric modification, parametric inerabilities)

5599 General (Spacecraft Optical Clow)
Visible GLOW INDUSTOR BY SPACECRAFT-ENVIRONMENT INTER-

J.H. You illervard-Suithscoton Contet for as J.H. Yes Hiervard-Sulthsooten Centet for actrophysics, e0 Garden Street, Cambridge, Na Ollist, and V.J. Abreu Hiuminetion res Icuad Cacatally in the real direction of the Shuttle Orbitor arising from initeaction with the embient surrounding atmosphere. We have examined a strain of the street of the surrounding atmosphere. We have examined a strain of the surrounding atmosphere in board the atmosphere Explorer Statilities. Anatysis at six different wavelengths from the ultraviolet to the mean infrared suggests that the glow has a diffuse head or continuous spectum which pasks to the red sed probably in the infrared.

Coophys. Res. Lett., Paper 3L009t

Particles and Fields— Magnetosphere

5705 Bow Shock Maves
\$IABILITY OF ELEITRIN OISTRIBUTIONS MITHIN THE EARTH'S
BOW SHOCK.

H. F. Thomsen IMS DAJA, tos Alawos Mytlocal ighorotory,
Los Alamos, IMS DAJA, tos Alawos Mytlocal
The Linear Victory stubility of a clara of elertron
velocity distributions which model those observed within the aerth's box shock is exemined. The study is
restricted to alectrostatic waves which propagate
pardils to the ambiest impactic field, 8. Two Instabilities are identified which are driven by fras
evergy in the direction parallel to 8: An ion acoustic
wave, alth real frequency below the ion piessa
frequency; and so electron aconefit wave, with real
traquency of several times the ion plassas frequency.
The chorestericitics of the usstable waves are in accord waves fo be polarized poralisi to the magnetic field. The leateOllises identified here may contribute to electron dispipation in colfisionings shocks. [Collisionies shocks, electron distributions, in-

description of the Character of the Component of the Character of the Char

Siso Mave propagation

QUARTITATIVE STUDY OF SUPETON-ASSOCIATED VLY PHASE
ANNALIZE AND PERCIPITATION DESCRIPTION ON

NOVEMBER LITTE 1919

I. Kikuchi (Radio Sesserth Lebotatories, togans), Tokyo

Phase successive search and the superior of the superior with the superior of the superior

5515, 5520, 5560

5155 Fissma Instabilities
GENERATION OF LOUSE STEED WAVES BY INNOMIGENEOUS
ELECTRON STREAMS
M.J. Rawhtone jeans! Research Laboratory, Washington,
U.C. 10375) and J.A. Hubs
A linear, alsercontails, kinsils theoty of valority
sheared inhopogeneous electron attented

A linear, electronizatia, kinsils theoty of velority sheared inhomogeneous electron streams llowing parallel to a magnetic lield be presented. Our development, which includes the effects of a deumity etadism, batkground pissua, and electron coliticans, is welld lot schitzery T_o/T_o and T_o/T_o have T_o/T_o, T_o are the temporataris of the sheared electrons, hatkground electrons and betheround lone, respectively. Sor but steedarm etrasua T_o/T_o> 1 and T_o> T_o, we find a new resonant lottability driven by velocity shear with frequency oner the lower hybrid itsquency. Tale mode is therether/and by versounders h such that kines { | where t_{los} is the sheared electron gyroradius and to damped by rottulional effects. Application is need to wave turbulence in the suroral some med cotar agreem.

J. Geophys. Ros., Riuo, Paper Modili J. Geophym. Res., Blue, Paper DAOIII

Sif5 Trapped Carricles
THE ADIABATIC MOTION OF CHARGES DUST CRAINS IN
ROTATING MAGNETOSPHERES
T. G. KOTTOPO (Laboratory for Righ Energy
Astrophysics, Mask/Goddetd Space Flight Center,
Greenbeit, IM 20111: 1. S. all
Dust grains in the ring systems and repidly totaling
magnetospheres of the outer planets such as Jupiter and
Saturn may be sufficiently charged that the magnetic
and electric forces on these are comparable with the
gravitetional force. The adiabatic theory of charged
patticle motion has nevalually been smilled to allocations

gravitational force. The adiabatic theory of charged particle coxion bos praviously been applied to electrons and stocks size porticios. But it is also applied by these charged dust grains in the micrometer and smaller size range. We derive here the guiding center equation of motion, drift velocity, and parallel quantion of motion for these guiding in a rotating augmentusphere. The elfetts of periodic grain charges discharge have not been troated praviously and have been included in this analysis. Grain charge is affected by the surrounding plants properties and by the grain-plasms valuelty (among other lactors), both of which may very over the gyro-circle. The resulting of which may resy over the gyro-circle. The resulting charge-discharge process at the gyro-requency destroys the inveriance of the magnetic monont and causes a grain to move radially. The magnetic monont may increase or decrease, depending on the gyrophase of the charge variation. If it decreases, the motion is always towards synchronous radius for an equatorial grain. But the orbit becomes circular before the grain reaches synchronous radius, a conclusion that indices from an exact constant of the orbits. This circularization can be viewed as a consequence of the gradual reduction in the magnetic moment. This circularization also suggests that dust gratum leaving to could not reach the ragion of the Jovian rtog, but several effects could being their conclusion. Excelling qualitative and quantitative agreement is obtained between ediabatir theory and detailed sucrical othit integrations. (Charged Daur)

Planetology

65f5 Gross properties of the Moon [Magnetit palaoin-

66f5 Gross properties of the Moss [Magnetic palaoin-leasity]
A MEYIEW OF LUMAR PALEOTHENSITY DATA, AND IMPTICATIOUS FOR INE ORIGIN OF LUMAR MAGNETISM
S. M. Cleowsti, ICapartment of Physice, University of Mewrastic upon Tyes, Newcaetla upon Lyes, Englandi, O. W. Calthron, S. K. Runcors, A. Stephaneon and M. Fuller
The selevation remembers home in the selevation of the paleointeneity antimatics has been applied to more than 50 lonar samples, and has been calibrated in barms of standard intensity of the Earth's segostic flaid, comparable in intensity to the Earth's segostic flaid, exclude from about 1.6 to 3.8 AE. Aboriole palaointensity matinales and leart sorface tiald strength datarminations one non-litent with this observation. The data presented here differ from previous destriptions of the variation in the lunar field aith time in that A) the aldost samples (>3.0 AE) are emogst the most weekly segmentized; Bl as order at segmented drap in paleointeelty is suggested between the fine of extrusion of the Apoila il low and high potassium baselts. The lifted range in age of the etrongly segmented lunar samples and the expense of shocked samples in this ast argues against a solar source for the knormal standard and the beginning of mate baselt entrusion at the high field era with the termination of Saela forming imports and the beginning of mate baselt entrusion suggests a common cause. A close approach of the Moon to the Eerth of about 3.8 AC may account for all three phenomens, The confined duration of the etrong lunar flatd may allow for the assignment of relative ages for rerists lumar respice and lunar earches feature. (Lucar, palaointensity, magnetic flatds).

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6515 Surface of Sianots CONGERT OR 'S SCHEMATIC MODEL OF CRATER MODISICA-TION BY GRATITY BY C. J. Matcah R. J. Fihs (U. S. Geological Survey, Henlo Parh, Cl 24025) CA 94075)

Natesh's theoretical under for the colleges of large impoor orscame is based partfy on saconsisteat or entiquency seported charteries. Stepser pressure a table of data that describe the conset of complex morphologic features in creaces on Marcury, earth, the moon, Mare, Canyaded, and Califato. Melash's onest diseaser sontradict the veil-established absented that an otral peaks appear in sealier orstace than do sfo teastroses. Additionally, the geometric tatacies of his model's college on translate cavity is the observed areate landform is declared.

This cot discourses vertocs problems with descriptive comphotogis date for impact creases and presents a ravined Labts of onest diseases. This cot disposes a vertocs problems with dependent of the last of onest diseasers in capable, casteses, pitted peaks, and pank orga on the ale planete and actatities. The latest la to cherily some of the liscour entand by Melosh's work and so help establish a mesa consistent body of chéacvailous. Fionly, a qualitative modal for the transleat cavity of large impact entars attampts to reconcile some of the sease of the sorphologic chearvation with Melosh's theory.

The transleat cavity propound bear has a gaonestrating expelicants and gontegic field observations of complex tarrestell metaclist tratace. According to this achieve the deep lumber body forms impacting tarrestell metaclist tratace. According to this achieve the deep lumber body forms a shallow outer dish later in the happet develops too a shallow outer dish later in the happet tarted as the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the action of the control peak, whereas sheagent familiag at the Meloth's theoretical under for the colleges of